QUEENSLAND AGRICULTURAL JOURNAL

VOL. XIII. JANUARY, 1920. PART. 1.

Agriculture.

PURE SEEDS.

Complaints are frequently heard concerning the inferiority and non-germinating of farm and market garden seeds. In many cases the fault lies not with the seedsmen who supply such seeds but with the growers, owing to their loose carelessness, or ignorance, of the conditions under which alone certain seeds will germinate with resulting good crops. The Department of Agriculture, since the year 1915, has undertaken the testing of all agricultural seeds, under the Pure Seeds Acts of 1913 and 1914, by a qualified expert in the important work. It had been noticed by the latter officer, when seed-testing operations were commenced, that considerable quantities of oversea lucerne seed were landed in Australia and appeared on the local markets as Hunter River seed (New South Wales), which was sold at a large profit. It is stated in the Annual Report of the Department for 1918-1919 that this happened in 1916-1917; and, although attention was drawn to the practice, and particularly to the danger of the importation of weeds such as Hexham Scent which are against the interests of dairy farmers, the practice still continues; and of eighty-five samples of lucerne seed examined last year, twenty-one were of South African origin, and probably each lot represented a ton or more of seed.

The Regulations under the Pure Seeds Acts require all seeds classed as low grade to be distinctly marked as such, with the germination per cent. clearly and indelibly branded on the bags; all invoices and labels must also give the percentage of germination with date of test. This is most important to both buyer and seller, who should thus be able to fix a value in accordance with the percentage of growth. In the buying of both Rhodes and Paspalum, the price per pound of the seed has no relation to its value unless based on the percentage of germination.

Out of the 112 samples of Rhodes Grass seed tested during the year, only 15 were up to the prescribed standard of 40 per cent. germination; the average growth of these samples being 43 per cent.

The prescribed minimum for low grade is 20 per cent.; and 53 samples with an average growth of 25.8 per cent. were so classed. The remaining 44 samples did not comply with the Acts on account of germination or impurities.

Paspalum is one of the most difficult seeds to test, and, in the past, has caused much disappointment by the failure of seed of good appearance to make a stand.

As an outcome of these complaints, several prosecutions were instituted about a year since; and the Department is pleased to be able to report that the seed now offered for sale is of much better quality.

America is a large buyer of both Rhodes Grass and Canary Seed; and it is recommended that our merchants would do well to get into direct communication with the United States.

At present large quantities are sent each year to Sydney. Most of this is shipped, after bearing cost of freight and merchants' profits, which should be kept, if possible, within our own State.

During the past season several complaints have been made as to the quality of the oats offered for sale.

These, in nearly every instance, were purchased in the South by produce merchants, in order to supply the demand for a cheap line of oats. Farmers seldom bother to ask for seed oats, the price being, in most instances, the deciding factor, not quality. Unless buyers distinctly ask for seed, little can be done for the protection of their interests. Three lots of oats offered for sale as seed were found to contain, respectively, 10.499 per cent., 18.15 per cent., and 19.752 per cent. of weed seeds. In each instance proceedings were instituted with success.

It is satisfactory to learn that both seed merchants and farmers are now availing themselves of the Seed Laboratory for the identification of weed seeds. During the past year over 40 lots were sent in to be named, amongst them being Hexham Scent, Oriental Rocket, Giant Brome, Dodder, Dock, and many others found in seeds offered for sale as seeds for sowing.

The more general use of seed-cleaning machinery would remove most of them; and farmers would do well to purchase only from those who clean and grade their seeds.

The subjoined tables will serve to show the important work in seed-testing carried out by the Department:—

AGRICULTURAL SEEDS TESTED UNDER THE PURE SEEDS ACTS OF 1913, 1914, 1915, 1919.

Number of Samples Tested.	Year.	Number of Samples Tested and Found—		Number of Samples Condemned on Account of—	
		Standard.	Low Grade.	Impurities.	Germination.
301	1915	162	29	35	75
759	1916	505	152	11	91
706	1917	487	124	6	89
760	1918	472	145	29	114
817	1919*	489	170	36	122
3,343	Totals	2,115	620	117	491
In Percentage ..		63·3	18·5	3·5	14·7

* Six months to 30th June.

VEGETABLE SEEDS TESTED UNDER THE PURE SEEDS ACTS OF 1913, 1914, 1915, 1919.

Number of Samples Tested.	Year.	Number of Samples Tested and Found—		Number of Samples Condemned on Account of—	
		Standard.	Low Grade.	Impurities.	Germination.
166	1915	93	18	8	17
236	1916	161	32	2	41
314	1917	200	53	3	58
310	1918	206	58	3	43
528	1919*	436	60	2	30
1,554		1,096	221	18	219
		70·5	14·2	1·2	14·1

* Six months to 30th June.

POSSIBILITIES OF FLAX.

There are several lucrative crops grown in Europe and in other parts of the world which may be easily and advantageously grown in various parts of Queensland, according to the climatic requirements of each. Amongst such crops, flax takes, or should take, a prominent place. On this subject we have, in previous issues of the Journal, published several articles dealing with the whole industry from seed time to harvest; and we particularly draw attention to the article on "Flax and Linseed," which appeared in the issue of the "Queensland Agricultural Journal" for September, 1918. Further articles will be found in the numbers for June, July, September, October, and November, 1919. Our readers will find valuable food for thought in the following letter, which appeared in a late issue of the "Brisbane Courier," by Mr.. R. F. Strachan, Craigee, Goondiwindi:—

"I was greatly interested in the article 'Flax Crop' appearing in your issue of the 15th instant. Being one of the first to experiment in the growing of flax for fibre and seed (linseed) in New South Wales (I obtained first prize and certificate at Royal Agricultural Show, Sydney, 1905, for an exhibit of flax straw—retted—flax fibre, and linseed), it has occurred to me that the public might be interested in learning some additional facts concerning flax-growing and its possibilities.

"As indicating the range and extent of the cultivation of the flax plant—prior to the war—Russia put under crop annually 2,600,000 acres; Austria-Hungary, 165,000; Germany, 150,000; Italy, 130,000; Belgium, 76,000; France (variable), 70,000 to 150,000; Holland, 21,000; Ireland, 50,000; Roumania, 63,000; Norway, 5,000. Except in Lincolnshire, little was grown in England. The United States of America usually cropped 1,300,000 acres for seed. Canada is also a producer; and the Argentine's annual output is approximately 33,000,000 bushels of seed. In Egypt the plant has been grown from time immemorial; and India is an immense producer of an inferior class of large seed, mostly used for oil and oilcake—one of the best 'beefmaking' cattle foods known, and if fed to 'milkers' will considerably increase the 'butter-fat.'

"Thus it will be seen that flax accommodates itself to greater vicissitudes of climate and soil than any other economic plant. In 1902, at Urana (Riverina), I planted (side by side) 5 acres of wheat and 5 acres of flax under exactly similar conditions of cultivation. Owing to the drought, both died; but the flax remained green long after the wheat growth had entirely disappeared. This experiment showed the drought-resisting qualities of the plant. On the other hand, owing to the 'oily' nature of the plant, it will stand more rain than any other kind of cereal before shelling-out, and the fibre cannot spoil.

"The supply of flax fibre has never overtaken the demand, and is at present much below requirements. Consequently the price is very high, I understand the Imperial Government, through the Commonwealth Government, is offering up to £160 per ton. At this rate and the enhanced value of the linseed, the approximate return per acre for a good average crop would be about £30 clear of expenses. I have often been asked, 'If there is such a good thing in growing flax, why is it not more exploited?' From my experience and observations, I find that the chief obstacle is the want of a flax mill for extracting the fibre from the 'flax hay.'

"The position is this: We have, on the one hand, an unlimited market for flax fibre, but none on the other for 'flax hay' (*i.e.*, up to the point that any ordinarily intelligent farmer can grow it to). Once create a market for 'flax straw' by the establishment of retting, breaking, and scutching mills to purchase from the farmers the 'flax straw,' and I am confident that the flax-growing industry will rank with our principal products of wheat, wool, &c. Several farmers at Warwick, Clifton, Allora, &c., have put in small areas (2 or 3 acres) this year as an experiment. Unfortunately, owing to the droughty conditions, the seed grown was very attenuated in most cases; consequently the results will be considerably below the average. Owing to the want of a flax mill, the straw, with the exception of a bundle or two sent to the Agricultural Department, will be useless. Had a centrally situated mill been available, the straw could have been marketed, and the average return per acre considerably increased.

"I would suggest a company be formed. An area of, say, 400 or 500 acres be secured in a suitable locality for the growing and preparing of flax. Put in 200 or 300 acres. This would serve as a guide to surrounding farmers, and ensure a sufficient quantity of 'flax straw' to warrant the erection of a small plant to treat same—the same plan as adopted with butter factories. I might suggest that it could be run in conjunction with the butter factories. Having already trespassed at length, I will defer to another week the method of planting, &c., and its results as adopted by me in New South Wales."

THE VALUE OF IRRIGATION.

The Under Secretary for Agriculture has received the following letter from Mr. W. S. Harding, Inspector of Dairies, Esk:—

"The value of irrigation during these periods of drought is well demonstrated on Mr. James Gray's farm (Cobbi), situated on the Brisbane River, about 5 miles from Toogoolawah. Mr. Gray is irrigating about 7 acres of lucerne, from which he is feeding 100 head of stock, consisting of cows, horses, and young stock; he is not only keeping them alive, but in fair condition. I particularly noticed one portion which was watered about three weeks ago. The lucerne was over 3 ft. high, and had a strong, vigorous growth. The system used is spraying; and as one section of the paddock is cut through it gets a fresh watering of between 1½ to 2 in. of water. A 12-horse power oil engine is used to pump the water from the river; a 6-in. main carries it across the paddock; then 3-in. branches distribute it through the sprays. The pump used is estimated to lift 11,350 gallons per hour; Mr. Gray estimates to water 1½ acres in about twelve hours. When I called he was busy watering 3 acres of maize which was just above ground.

"Mr. S. H. Hosking has just installed another plant on the adjoining farm (Baccing Plain). He has watered about 4 acres of lucerne which appeared to be almost dead when irrigation was commenced, which was just about a week before I was on the farm. The results were marvellous. In some places the crop was quite 1 ft. high and making vigorous growth. These results go to prove beyond doubt the suitability of the Brisbane River water for irrigation purposes. I omitted to mention that the power Mr. Hosking is using is from a 16-horse power tractor, which he intends using for field work, ploughing, &c.

"Whilst visiting the Kilcoy district last month, I saw a small plot of lucerne which Mr. J. J. Webb had irrigated with a small plant throwing about 2,000 gallons per hour, the water being flooded on to the crop, which was looking splendid, and, although having only about a fortnight's growth, was fit to cut for green feed. Mr. Webb was also busy watering about 3 acres of maize intended for cow feed. He has a small concrete silo, which was filled last season with maize stalks and other green fodder. This has helped him to keep his cows going through this dry weather."

To the preceding letter from Mr. Harding on this subject, we append the following notes:—

When we consider that the importance of and the necessity for irrigation were recognised more than 2,000 years before the Christian era,* we can but marvel that in the twentieth century men are content to depend upon the uncertain rainfall to sow, cultivate, and harvest their crops. In this country there are many thousands of acres lying idle and worthless so far as the needs of civilisation are concerned, which have yet to be won to remunerative agriculture by judicious irrigation and drainage. The rainfalls in many districts are so capricious—the amount of water needed to produce heavy crops so great—the difficulties in the way of making our soils retain enough of the cloud water which falls to meet the demands are so many—that it must be plain to every practical man and student of agriculture who has devoted much thought to the subject that the time must come—has come in many cases—when the waters now running to the sea, with their tons of unused fertilising matter, will be turned to use in irrigating large tracts of the country over and under which they flow.

If 12,000,000 acres of the barren sand of the Sahara Desert in Africa have been rendered fertile by French enterprise, and many more millions by British irrigation works in the same country, notwithstanding the absence of fresh-water rivers and lakes, what could not be achieved in our richly-endowed State—richly endowed with large tracts of fertile lands, with numerous rivers flowing full during wet seasons to the Gulf of Carpentaria in the North, to the Murray in the South, and to the Pacific Ocean, along the extended coast line of Queensland? The one thing needful, after population, to make this State the greatest Agricultural Producer of the Commonwealth is that priceless boon—water. Although we have numerous rivers, yet many of them are but rivers in name; for in dry seasons they cease to flow, becoming either mere sand beds, or showing at best a chain of stagnant waterholes. Here, then, it is that the capitalist and the engineer have such an ample field before them in the way of conserving the vast bodies of water which periodically flood the country and are, as we have said, borne away to the sea, leaving the rivers to gradually dry up and once more resume their normal state.

Have we the men and money to lead the way in this vital matter?

There are many enlightened agriculturists, pastoralists, fruitgrowers, and others—some possessed of capital, others devoid of means—in Queensland who have taken the matter in hand, and who have, by perseverance, solved the problem of water conser-

* Virgil, in the Georgics II., advocates irrigation; he died in the year 19 B.C.

vation and proved how our lands can be saved from aridity. For years, in this rich State of Queensland, graziers have again and again struggled against devastating droughts surpassing the present ruinous drought. Depending as they did—and, in many cases, as they unfortunately still do—for the existence of their flocks and herds on an uncertain rainfall, they have, from time to time, suffered the partial or often the total loss of the results of their long years of labour and self-denial. When water failed, the grass and herbs disappeared, and with these large numbers of sheep and cattle also disappeared.

The sole resource of the Western pastoralists for a water supply consisted of dams excavated on the plains or on the banks of rivers, or of wells sunk here and there where water could be obtained at shallow depths. When these dried up under the influence of the sun, of scorching winds, or of long-continued droughts, then ruin stared in the face of the man on the land. An idea was generally entertained that irrigating is an operation attended with such great expense that it could be undertaken only by syndicates or capitalists, and that, therefore, the small farmer could never hope to derive benefit from any exertions he might put forth in the direction of making himself independent of cloud water, so very uncertain and capricious in a country devoid of high mountain ranges in the interior.

Nothing could be more contrary to fact. It has conclusively been found in this State that it is the smaller cultivators who derive the greatest benefits from irrigation; and for the reason that irrigation demands intense and deep culivation, that farms need not necessarily be large, that for this reason a larger population is enabled to settle on a smaller area, and that there will be more homes and more comfort and a greater enjoyment of the blessings of life for men of small means. The appliances and concomitant of a higher civilisation—of a higher condition of comfort of living, and of morality—naturally follow on a condition of closer settlement; so that this simple matter of irrigation presents such vast possibilities and potentialities as can scarcely be grasped by any but those who have had practical acquaintance with the social and moral conditions of rural communities where irrigation is the rule and not the exception. To sum up:—Consider what irrigation does for us. It enables us to cultivate to a profit the arid soils of the West, especially where railway communication connects with the Coast. It makes the desert literally to blossom. It makes paying crops a certainty. It multiplies the productiveness and carrying capacity of the land. It renders the farmer perfectly independent of rainfall. It enables the orchardist and vigneron to produce the choicest fruits to perfection, and, even where there is a good rainfall, it increases threefold the value of the land in such districts.

If the dwellers in Australia alone knew what vast areas of fertile land—what inexhaustible stores of artesian water—what facilities for carriage of produce exist in the Central district alone—and what heavy crops of cereals and fruits are there produced by irrigation—the so-called Desert and Downs Country of that part of Queensland would be laid under cultivation from Emerald to Longreach and Barcaldine by hard-working home-seekers, by farmers who understand their business, by men who know that success as certainly succeeds labour in such irrigation areas as night succeeds day. It is only of recent years that, here and there, practical provision has been made either for the storage of water or for obtaining a regular supply for irrigation purposes by means of artesian wells, shallow "gang" or "tube" wells, and pumping from river and lagoons. True, artesian water has been flowing from several hundred wells in the Western country for many years, and dams have been constructed on almost every cattle and sheep station in the State; but these wells were not intended for any other purpose than that of watering stock. The agriculturist, pastoralist, dairy farmer, &c., all depended alike on an uncertain rainfall for the production of crops and grass.

As giving an idea of the possibilities of agriculture by irrigation in the South-west of the State, I will take the Warrego River. Independently of the bores, there is an opportunity here presented for the storage of vast quantities of water which would amply suffice for the needs of hundreds of wheatgrowers and other agriculturists, if only the Government, or some wealthy capitalists like those of Mildura in the sister State, could be induced to take up the scheme. It is this:—

The winding course of the Warrego, from its sources in the Main Dividing Range beyond Augathella to a point about 8 or 10 miles below Cunnamulla, is about 350 miles; and throughout the whole of this distance there is everywhere as fine soil for wheatgrowing as the most fastidious farmer could wish to put the plough into. Even after the most terrible drought which has ever been recorded since Sturt's time (1902), there were to be seen splendid reaches of deep water at short intervals all along the river's course. As for the river in flood time, it is then really a river, and a grand one throughout. It did not appear to me as if it had much fall, as the water scarcely flowed quickly southward even in the longest reaches. Now, can anything be done to store this water which now goes practically to waste? The answer is, "Yes," and at an outlay small indeed in comparison with the benefits

to be derived from the work, both by the State lessee of the land and by the State itself. But a few more words on the waterholes of the Warrego, which may be seen at every few miles. Just below Charleville there is a fine stretch of water. Between that and Dillalah there are two or three, and several between Murdoch and Claverton, and on past Coongoola to far beyond Cunnamulla.

If a 10-ft. overshot dam were erected at Kane's Crossing, 4 miles below Cunnamulla, so level is the land that that single dam would throw water back for over 30 miles. When that water is dammed back, a sand dredge would easily remove the sand which is busy obliterating what, at one time, must have been a deep, noble river. The width of this stream would be about 3 chains, and the depth of water 10 feet. That means that over 1,900,000 gallons would be safely retained in this one locality. A sum of £60,000 to £70,000 would erect head works among the deep valleys at the source of the river, and about ten overshot dams would be needed. These would cost about £3,000 to £4,000 each. Thus the expenditure of £100,000 would retain all the vast volume of water which now goes to waste every year, amounts to, roughly, 10,000,000,000 gallons. Does it not seem the acme of folly, when good rains have come and grass is growing all over the country, to rest content in a fool's paradise, and cry "Safe," when there is no safety from the inevitable recurring droughts?

Although I have singled out the Warrego River as an instance of its value as a basis for irrigation, yet there are many others presenting similar opportunities for their utilisation in like manner—such as the Balonne, the Maranoa, the Moonie, the Condamine, the Bulloo, the Paroo, the Elliott, the Burdekin, and many others.

THE POSSIBILITIES OF IRRIGATION.

Writing from Gatton on the same important subject of Irrigation, Mr. J. J. Carew, Inspector of Dairies, Gatton, brought under the notice of the Under Secretary for Agriculture the following matter, which may serve some useful purpose:—

"Yesterday I called" [28th November], he says, "on Messrs. W. Hood and Sons, Rugby Farm, Gatton, where an irrigation plant was installed some few months ago. On arrival I was shown the various crops—lucerne, potatoes, onions, vegetables —and also the irrigation plant. The lucerne paddock, 30 acres, half of which was harvested during the week, yielded from 15 cwt. to 1 ton of trussed hay per acre, which realised the high price of £18 10s. per ton in the open market. The remaining half, to be harvested during the next few days, is a three-weeks' growth and stands from 18 to 24 in. in height.

"Potatoes, 2 to 2½ acres, which were being sprayed on my arrival, are now in the flowering stage and carrying, apparently, a full complement of young tubers the size of hens' eggs. Merchants already are negotiating with Mr. Hood for the purchase of the whole crop, which is the healthiest and most promising plot of potatoes I have seen for years.

"Of the onions there are about 6 acres now being dug and prepared for market. They are mostly of the Hunter River Spanish variety, medium to large size, and apparently of first quality. A yield of 5 tons of marketable onions per acre is anticipated.

"Messrs. Hood and Sons have made it possible—through the judicious use of the water pumped from the Lockyer Creek, and carried over the farm through pipes fitted with spray taps at regular intervals, and coupled in such a way as to make it convenient to disconnect and remove the pipes whenever necessary—to not only grow a sufficiency of green feed for their stock and keep the market well supplied with various kinds of vegetables, but are also in a position to put fodder and other crops on the open market, where they are now reaping the harvest such men richly deserve for the excellent example they have set to others."

COTTON-GROWING IN AUSTRALIA: REVIVAL OF INTEREST.

Introductory.—Every effort is now being made in Queensland to revive interest in the cotton-growing industry. From a variety of causes, which it is not necessary to traverse in detail, the industry has had its ups and downs, and although, as a rule, the acreage has remained small, authorities on sub-tropical agriculture feel confident that not only in this State, but in other portions of the Commonwealth, cotton-growing is capable of considerable extension upon a commercial basis.

As far back as 1858 the establishment of the industry was strongly advocated by Dr. Lang, who had made successful attempts to cultivate cotton in New South Wales. In 1861, upon the outbreak of civil war in North America, prices rose to a high figure, and Queensland was able to supply relatively large quantities of the world's requirements. Prices, however, fell rapidly at the conclusion of the war, and Queensland's activities dwindled in consequence. The early eighties saw a renewal of effort, which was marked by the formation of the Ipswich Cotton Company and the manufacture in Australia of cotton goods. The mill eventually passed into the hands of Joyce Brothers. The industry, however, again declined, but was carried on in a small way by a few growers. In 1902, when Australia was in the grip of a particularly bad drought, the Queensland Government, through the Department of Agriculture, in order to encourage the cultivation of cotton, not only for the lint, but also as a fodder crop for emergency purposes, undertook to supply seed, receive the crop, gin and sell it on the owners' account, and to make an advance when the raw cotton was received into the store. The acreage again began to extend. As the result of war conditions, the net return to the grower has been as much as 4d. per lb., which, on a yield of 1,000 lb. per acre, is equivalent to nearly £17 per acre.

The principal economic consideration was, of course, the price obtainable. There was, however, another aspect which is important and interesting. In the early days a great proportion of the seed which was cultivated was of the Sea Island cotton, but recently Upland American cotton was introduced, and produces almost the whole of the lint placed on the market. It is regarded as excellent in quality. Suitability of varieties must be determined before permanent and satisfactory progress can be made.

In its present campaign, the Queensland Department of Agriculture does not favour a return to the plantation or large area system, and strongly urges the cultivation of a few acres on a farm as a subsidiary crop. Its reason for so doing is twofold. In the first place, the kanaka labour that was available in the plantation period is not now to be obtained; and, in the second place, a grower can handle, say, 10 or 12 acres without recourse to additional and temporary assistance. Later, if the cultivation of cotton becomes an established industry, the areas would naturally be enlarged in proportion to the profits derived.

Special Committee's Report.—When the possible re-establishment of the industry came to be considered, the Queensland Committee of the Institute of Science and Industry displayed an active interest in the question, and upon its recommendation the Executive Committee of the Advisory Council appointed the following gentlemen to report upon the matter:—Messrs. J. B. Henderson, E. G. Scriven (Under Secretary, Department of Agriculture), N. Bell, D. Jones, and Professor B. D. Steele. Prior to this the Institute had interested itself in one or two phases of the industry, such as the perfection of a mechanical cotton-picker and the investigation of varieties. Immediately upon its formation, the Cotton-growing Committee made a careful survey of all available evidence, and submitted the following statement to the Executive:—

The causes of the past failures are many and complicated—different causes appearing to preponderate on different occasions. Amongst the adverse conditions that have operated, the following may be mentioned:—

(1) Cost of transport to the world's markets during periods of low price.

(2) Lack of local market which would absorb the crops during such period.

(3) Competition with other crops believed at the time to be more profitable, accentuated by the smallness of the agricultural population in Queensland.

(4) The cultivation of unsuitable varieties of cotton.

Plants of the cotton family are indigenous to Queensland, and it might, therefore, be expected that such plants would thrive in this climate. The experience of the past sixty years confirms this expectation, and from all the evidence available it may be taken as established that in a great number of districts in this State climate and soil are entirely favourable to the production of good crops of cotton of excellent quality. Moreover, the cotton appears to be more resistant to drought than certain of the local staple crops, such as potatoes and maize. It has proved also a good reserve in drought as a stock fodder.

It becomes necessary, therefore, to ascertain whether the causes to which the former failures are to be attributed are still operative.

Considering first the question of growing for export, it is clear that Australia labours permanently under the dual disadvantages of distance and of competition with other countries where abundant cheap labour is available. It is, however, quite possible that the growing of a long-staple variety suitable for export may enable these disadvantages to be successfully overcome.

Looking at the matter from the point of view of the local market, the possible outlets for raw cotton are—

(1) The manufacture of nitro-cotton by the Commonwealth Explosive Factory. This offers an immediate demand for a limited quantity of cotton. The annual demand of the factory is about 50 tons.

(2) The manufacture of mixed cotton and woollen goods. This outlet is also limited, but in 1916 and 1917 a total of 282 tons of cotton was imported from the East for this purpose, in addition to 25 tons of Queensland cotton sold in Australia for that purpose.

(3) The prospective manufacture of cotton goods in Australia. That is, as indicated, prospective; and past experience at Ipswich leads us to the conclusion that its development will depend largely on fiscal policy pursued by the Commonwealth Government.

The utilisation of the cotton seed by the manufacture of cotton-seed oil and other by-products will yield further returns, and must be taken into account.

We are of the opinion that the present consumption of raw cotton in Australia is sufficient to give the cotton industry every opportunity of becoming established as a staple primary industry. If this opinion is correct, it becomes necessary to consider what will be the best methods to adopt to encourage its development.

We consider it necessary—

(1) To take every possible precaution to prevent the introduction from America or elsewhere of the various cotton pests. With this object in view, all imported seed should be propagated in quarantine before distribution.

(2) To ascertain the most suitable varieties of cotton to meet—
  (*a*) The requirements of Australian consumers;
  (*b*) The climatic and soil conditions of the districts in which cotton can be grown with advantage;
  (*c*) The possibility of using the mechanical picker.

(3) To encourage farmers to grow each a few acres of cotton as an auxiliary crop, rather than prematurely to reintroduce the plantation system.

  This mode of procedure is advisable as presenting the dual advantages that the farmer is not at the mercy of a possible failure of a new type of crop, and that a crop of a few acres could be picked by a family of average size without employment of casual labour.

  We would suggest that the following methods of encouragement might be adopted:—
  (*a*) Propaganda with issue of suitable bulletins.
  (*b*) A continuation of the State Department of Agriculture's system of ginning and marketing on owners' account.
  (*c*) A guarantee by the Commonwealth Government for five years of an amount certified to by the State Department of Agriculture that will enable the grower to receive 4d. per lb. for seed cotton on the farm.

(4) To stimulate similar development of the industry in States other than Queensland on the grounds that the larger the production of raw material the more likelihood there will be of the establishment of factories for the manufacture of cotton goods. Once these are fairly established, the stimulus between the primary and secondary industries will be mutual.

(5) To continue experiments that have been started aiming at the production of a cheap and efficient form of mechanical cotton picker.

From such information as is available, this Committee concludes that sufficient protection will be afforded without the imposition of any Customs duty. Stringent quarantine regulations must be prescribed and rigidly enforced.

To assist in doing this, we recommend that a limited number of ports of entry be prescribed, and that adequate fumigation chambers and plant be installed

at each of these ports. By this means the introduction of pests will be prevented, and, at the same time, the cost of fumigation, which should be paid by the importer, will afford appreciable and adequate protection to the growers.

The Committee consider it absolutely essential, if the introduction of pests is to be prevented, that this fumigation should be established apart from any question of protection. As kapoc is imported from the East in quantities, it is considered essential that it should also be fumigated on importation.

(NOTE.—It has been reported to us that soldiers and others are introducing small quantities of cotton seed into the country, chiefly from Egypt. There is grave danger of the introduction of Pink Boll Worm and other pests into the country by this means.)

Any attempt to encourage the growth of cotton in Australia should have as its ultimate aim the establishment of a cotton manufacturing industry in the country. Past experience at Ipswich teaches us that such an industry cannot flourish without some measure of protection. As soon as the production of cotton has reached the stage where it can more than satisfy the requirements of the present consumers of raw cotton in Australia, the question of the imposition of a duty on manufactured goods and the amount of protection needed will become an urgent one.

In the meantime, it is the duty of the growers to demonstrate that they can profitably meet all present requirements.

Action taken by the Institute.—The Executive Committee has for some time been of the opinion that the most hopeful method of solving the labour problem is by the introduction of a mechanical picker, which would obviate the necessity of hand-picking. Inquiries were consequently made from numerous sources in the United States, and a good deal of information was obtained on the subject. As the result of a number of laboratory experiments, a machine has been devised, and is now being constructed, which it is considered will survive all practical tests, and fulfil the requirements for which it is intended. There is a limit, however, to the powers of this machine, or, indeed, of any type of mechanical cotton-picker, inasmuch as tractable varieties alone of cotton can be picked. Mr. Daniel Jones considers that the tractable type can be grown at the same value as the intractable type, and that the quality is merely a question of cultivation and seed. To this end, therefore, he has secured certain varieties from various places in Queensland, and they are being cultivated near Brisbane. A practical test of the picker should, therefore, be possible during the next autumn.

In addition to the seed already introduced into Queensland, the Institute has made arrangements for the importation of seed from the United States. The request sent to the Bureau of Agriculture was for the high commercial varieties grown in localities whose climate is similar to that of Queensland, and steps have been taken to have all imported seed thoroughly fumigated to prevent the introduction of pests. Upon its arrival the seed will be treated at the Department of Agriculture, Brisbane, and will be grown under the supervision of officers of that Department.

In view of the recommendations of the Queensland Committee, the Executive Committee gave close consideration to the question of a guaranteed price for a number of years. The conclusion arrived at was that the Commonwealth Government should be recommended to guarantee the grower 4d. per lb. for seed cotton for the crop to be harvested in 1920, and the price for succeeding years to be adjusted according to the world's price and to local requirements. At the present time the Liverpool price for ginned cotton is 1s. 6d. per lb., and, as it takes 3 lb. of cotton in the seed to make 1 lb. of ginned cotton, it was considered that the price agreed upon, while offering profitable returns to the grower, would not commit the Government to any great financial risk.*

It is officially estimated that an average crop of cotton in Queensland should produce 1,000 lb. per acre, which would represent, at 4d. per lb., a gross return of £16 13s. 4d. per acre. Allowing £5 per acre for working expenses (planting and cultivation £2, and harvesting £3), the net return would be £11 13s. 4d. With the prospect of securing such prices, the Department of Agriculture anticipates a considerable extension of the acreage for this year, and a general stimulation of the industry.—"Science and Industry."

* This matter of a guaranteed price of 4d. per lb. to the grower has, in consequence of representations by the Queensland Department of Agriculture, been conceded by the Commonwealth Government. Cotton-growers during the year 1920 are thus assured of a generous fixed price for all seed cotton delivered by them at the State Ginnery. Furthermore, should the price of ginned cotton continue to rise, whatever extra price may be received owing to the very probable conditions obtaining in the export of cotton from the United States, Egypt, and India, any increase in the price of ginned cotton will result in a corresponding increase in the price of the farmers' seed-cotton.—Ed., "Q.A.J."

SOME FODDER GRASSES.

ELEPHANT OR NAPIER GRASS

has received a good deal of notoriety, but from reports published by the New South Wales Department of Agriculture, is in no way superior to other classes of fodder already established, and is certainly not so nutritious as the saccharine Sorghums.

Mr. W. Brotherton, of Gladstone, some three years ago, advertised seed and sets for disposal; but, so far as can be ascertained, this forage plant has not displaced other well-known fodders in that district.

Elephant Grass may be propagated in a similar manner to Cow Cane—*i.e.*, by "sets"; but, from reports, it is inferior to either Indian Cow or 90 Stalk Cow Cane.

SOUDAN GRASS

is one of the latest and is fast becoming the most popular of all the Sorghum family. It stools rapidly, is of quick growth, adapted to most soils, and is capable of reaching a height of from 6 to 7 ft. in as many weeks where conditions are favourable. The stalk is fine in texture, and carries a heavy growth of succulent leaves; particularly adapted for silage and hay purposes; although, when intended for the latter purpose, a slightly heavier seeding is necessary. Under ordinary conditions, 2½ lb. to 3 lb. per acre are ample, sown thinly along drills spaced 2½ ft. apart. Interrow cultivation is necessary in the early stages of the plant's growth; but, as the rows are rapidly overgrown, weed growths are naturally deterred. Soudan Grass ratoons rapidly after cutting. Being a member of the Sorghum family, the usual precautions are necessarily adopted when feeding green to stock—*i.e.*, the plant must be in the flowering stage prior to feeding.

SORGHUMS

are divided into two families—*i.e.*, Saccharine or non-Saccharine. Examples of the former are—*Sorghum saccharatum*, Early Amber cane, Imphee or Planter's Friend, Orange cane, Saccaline; of the latter—Standard Milo, Feterita, Shantum, Dwarf Milo, Cream Milo, Valley Kooliang, Black Hull Kafir, White Kafir, Red Kafir.

Saccharine Sorghums are noted for their nutritious feeding values, but do not carry the profusion of fibrous leaf which marks the non-saccharine family; but, on the other hand, the stalk is juicy and succulent, whilst that of the non-saccharine is woody and fibrous, and practically has little value for stock-feeding purposes. Sorghums do well on most soils, but will thrive where maize would fail, and are, when compared with the latter, more able to withstand dry periods during their growth. Some of the Saccharine varieties—*i.e.*, Imphee—ratoon well in favourable seasons; and this variety withstands frost better than any other known variety; 5 to 7 lb. per acre are necessary when sown in drills from 2½ to 3 ft. apart.

Interrow cultivation is necessary to keep down all forms of weed growths.

Owing to the prevalence of hydrocyanic acid in the early period of its growth, the plant should be allowed to reach its inflorescence stage before feeding to stock in green form.

GUINEA GRASS

is a tropical-growing grass belonging to the Panicum family; stools 2 ft. in diameter being of common occurrence where conditions of heat and moisture are favourable; is propagated from rootlets—seed being difficult to save, owing to its unequal ripening; is more suited to coastal conditions than that of the drier interior; would under favourable conditions form a fair class of rough hay; but is somewhat difficult to harvest successfully, owing to the succulence of its leaves.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1919.

A big drop in the number of eggs laid has been the result of the excessively hot month of November. The condition of the birds enabled them to withstand the severe conditions. There was one death, E. F. Dennis losing his A bird, which had been giving such remarkably good results, the cause of death being inflammation of the bowels. The excessive water-drinking during the very hot days did not cause the trouble one would expect; in fact, the birds look bright. R. Burn's D bird broke a fine run of 81 eggs on the 22nd of the month. E. M. Larsen's C broke on the 20th, after laying fifty-five days in succession. Broodies have been very plentiful, there being in some cases only one bird left in the pen. The light breeds also have given trouble in this direction. The following are the individual records:—

Competitors.	Breed.	Nov.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	161	1,104
*T. Fanning	Do.	146	1,082
*W. Hindes	Do.	126	1,038
*E. A. Smith	Do.	140	1,016
*Dixie Egg Plant	Do.	102	989
*Dr. E. C. Jennings	Do.	131	977
*G. W. Hindes	Do.	117	949
*Haden Poultry Farm	Do.	120	948
*Range Poultry Farm	Do.	125	938
*Quinn's Post Poultry Farm	Do.	125	937
*B. Caswell	Do.	139	925
*W. Becker	Do.	135	909
J. H. Jones (Toowoomba)	Do.	127	908
*L. G. Innes	Do.	141	908
*C. P. Buchanan	Do.	129	901
S. McPherson	Do.	109	888
*H. Fraser	Do.	120	886
*J. J. Davies	Do.	129	867
*Mrs. L. F. Anderson	Do.	122	859
G. Williams	Do.	106	854
W. A. Wilson	White Leghorns	124	851
G. J. Byrnes	Do.	103	844
*Mrs. A. G. Kurth	Do.	128	835
*W. Lyell	Do.	118	833
S. W. Rooney	Do.	102	825
*Thos. Taylor	Do.	115	824
*Mrs. R. Hunter	Do.	119	802
H. A. Jones (Orallo)	Do.	81	800
Geo. Trapp	Do.	124	796
G. H. Kettle	Do.	108	776
B. Chester	Do.	110	769
*O. W. J. Whitman	Do.	125	756
Mrs. N. Charteris	Do.	116	750
C. A. Goos	Do.	114	744
H. O. Jones (Blackstone)	Do.	108	733
N. A. Singer	Do.	99	725
J. W. Newton	Do.	119	720
Oakleigh Poultry Farm	Do.	100	720
R. C. J. Turner	Do.	115	687
W. Morrissey	Do.	99	664
J. H. Dunbar	Ancomas	99	652

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Nov.	Total.
HEAVY BREEDS.			
*R. Holmes	Black Orpingtons ...	132	1,140
*E. F. Dennis	Do.	139	1,075
*R. Burns	Do.	131	1,057
*E. M. Larsen	Do.	122	1,051
*W. Smith	Do.	114	993
*A. E. Walters	Do.	103	972
Geo. Nutt	Do.	97	957
*Kelvin Poultry Farm	Plymouth Rocks ...	106	942
*E. Morris	Black Orpingtons ...	115	932
*A. Shanks	Do.	86	923
*Nobby Poultry Farm	Do.	105	910
*T. Hindley	Do.	118	870
*Jas. Ferguson	Chinese Langshans ...	102	847
*Mars Poultry Farm	Black Orpingtons ..	115	846
*D. Fulton...	Do.	83	837
*W. H. Reilly	Chinese Langshans ...	91	810
R. B. Sparrow	Black Orpingtons ..	136	808
Burleigh Pens	Do.	104	776
A. Homan	Do.	123	769
*F. W. Leney	Do.	99	759
*H. Puff	Rhode Island Reds ...	68	754
J. A. Cornwell	Black Orpingtons ...	116	702
*T. B. Barber	Do.	68	699
C. H. Singer	Do.	96	675
H. Ashworth	Do.	111	660
A. Gaydon	Do.	90	642
Total	...	7,635	57,395

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	189	174	192	185	180	184	1,104
T. Fanning	188	164	177	189	175	189	1,082
W. Hindes	187	178	172	157	172	172	1,038
E. A. Smith	169	163	186	167	156	178	1,016
Dixie Egg Plant	150	164	176	179	153	167	989
Dr. E. C. Jennings	167	140	167	158	159	186	977
G. W. Hindes	171	156	170	150	142	160	949
Haden Poultry Farm	175	174	165	154	126	154	948
Range Poultry Farm	138	162	175	168	139	156	938
Quinn's Post Poultry Farm ..	149	159	165	177	145	142	937
B. Caswell	130	99	153	185	197	161	925
W. Becker	181	159	172	141	108	148	909
L. G. Innes	129	173	129	162	169	146	908
C. P. Buchanan	134	174	136	143	147	167	901
H. Fraser	124	163	172	153	114	160	886
J. J. Davies	132	140	153	156	142	144	867
Mrs. L. Anderson	155	166	129	142	127	140	859
Mrs. A. G. Kurth	173	146	149	137	99	131	835
W. Lyell	129	148	158	130	135	133	833
Thos. Taylor	150	119	118	161	160	116	824
Mrs. R. Hunter	125	121	146	139	135	136	802
O. W. J. Whitman	121	152	118	111	132	122	756

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes	191	193	214	169	220	153	1,140
E. F. Dennis	188	164	191	176	155	201	1,075
R. Burns	185	160	172	222	163	155	1,057
E. M. Larsen	179	182	189	160	181	160	1,051
W. Smith	141	181	168	150	187	166	993
A. E. Walters	171	149	173	158	153	168	972
Kelvin Poultry Farm	202	134	151	133	170	152	942
E. Morris	156	146	169	159	187	115	932
A. Shanks	86	128	188	153	179	189	923
Nobby Poultry Farm	152	132	136	150	168	172	910
T. Hindley	165	158	119	161	125	142	870
Jas. Ferguson	146	188	120	118	139	136	847
Mars Poultry Farm	124	170	175	110	106	161	846
D. Fulton	123	140	146	132	155	141	837
W. H. Reilly	121	115	161	155	115	133	810
F. W. Leney	94	127	134	179	106	119	759
H. Puff	149	110	131	149	96	119	754
T. B. Barber	109	117	111	113	138	111	699

CUTHBERT POTTS,
Principal.

MARKETING EGGS AND FOWLS.

By R. T. G. CAREY, Beerwah.

The Queensland system of poultry and egg marketing is deplorably bad; also, the absence of such produce on the auction mart as dressed poultry, live capons, poulards, 1 and 2 lb. weight fatted chickens (commonly termed "broilers"), and other quickly remunerative selling poultry products, leaves the impression that neglect might be the producer's fault, or the buyers may be careless as to how their poultry products are forwarded so long as the fowl or egg requirements are obtained. It may also be that the consumers care little and do not worry much so long as their poultry requisitions are supplied. Thus this threefold personal carelessness is accountable for the very indifferent condition of our poultry products and for the unfavourable prospect of improvement, as their motto reads, "A fowl's a fowl, an egg's an egg."

Buyers and visitors to the auction markets witness sales of scrubs, weeds, culls, sick, halt, and maimed specimens which are commonly offered for sale. Those unhealthy and diseased birds cannot be palatable or appetising when prepared for the table; hence the disinclination of the general public to be consumers of poultry flesh; whereas the result of rearing, grading, and feeding those scrubs, culls, and weedy ones into proper condition would be productive of satisfaction and increased consumption.

Auctioneers' patrons will not bid high prices for the poorer qualities, because the birds must generally be fed up to good condition before they can be disposed of to their customers, but will freely bid several pence over and above ruling quotations for any crate of nicely fatted birds.

Many are the errors in forwarding fowls to the markets made by the consignors. How often does a worried "cocky" exclaim—"Off to the markets with them devils. What a great nuisance they be, eating their heads off, always in the horses' feed boxes, or troubling the pigs, and scratching grain out of the ploughed fields," &c. So he prepares an improvised coop, bundles in old cocks, old hens, young cocks, and pullets of all ages and sizes, because, he says, "They'll fetch a bob or two apiece," then carries them to the railway station, leaving them in the broiling sun, in a "Calcutta black hole" of a coop, without water or food to do a 150 miles or more railroad journey in addition to a probable jaunt of 15 miles on a dusty road upon a rickety vehicle to the rail siding. No wonder they don't pay—these poor, weary,

hungry, thirsty, and almost suffocated creatures; how could they look prime on market day, when they are so down-hearted after being buffeted and knocked about from cruel handling? Invariably the auctioneer's account sales states: "Crushed some were dead, poor condition, and so forth; therefore, the full benefit of market ruling prices could not be realised for your consignment."

The remedy is, to consider their comfort; place drinking water and feed vessels in their black hole of a coop; allow greater space for each occupant; likewise increase the height of the crate. Then only will the birds' welfare and appearance on sale day appeal to the observant purchaser and command the highest "bid." By neglect of such matters, the sender renders himself liable to be prosecuted by the Society for Prevention of Cruelty to Dumb Animals (birds).

Brand, by a stamp or stencil plate, your name and address, and date of railage on coops or crates before sending, thus gaining the confidence of a brigade of buyers and not suffering your "Waterloo."

Eggs are valuable at any period of the year; but how frequently do cases of them, when opened up for inspection at the salerooms or on grocers' counters, exhibit a begrimed condition; some broken by bad packing, soiled, and nest stained; small and large ones, mixed with ducks', turkeys', and guinea fowls' eggs; some even a couple of weeks old, fertile ones, and containing a decayed or dead germ, and all ungraded. These are but some of the faulty conditions that cause low returns.

The remedy is: Careful grading for shape, size, and colour, packing in egg fillers wherever possible; consigning twice weekly; rubber-stamp them with name, address, &c. This may be all extra labour; *but it pays.*

NEW-LAID EGGS.

This means day-old egg when marketed; two days old when sold by the grocer; and three days old when used by the consumer. They lose their newness after the third day. Now, new-laid eggs of 2 oz. size, and clean, will always command a premium; but they are a perishable food product, and are liable to rapid deterioration brought about by shrinkage of moisture, rot, or rotted by death of the fertile germ, and contamination by absorption of bad odours; so that when they reach the city and should have been sold as "new-laid," they are found to have an objectionable odour caused by absorbing, through the pores of the shell, the foul odours that happened to be in close proximity while in transit and otherwise.

How essential it is, then, to exercise great care to have them thoroughly clean and well packed, also delivered in attractive packages, thereby establishing a regular trade (as long as the supply holds out) with the best class hotels, cafés, clubs, restaurants, and grocers, who are all willing to pay a premium for a guaranteed article.

FRESH EGGS.

These may be about two weeks old, and generally are from farms—whence, when convenient, they are taken to a country town storekeeper, perhaps traded for merchandise, held by the storekeeper for another few days longer, then hurried to the city mart under unfavourable conditions, such as overheated and packed in strange cases or kerosene boxes, the oily odour of which is emitted from the saturated timber, or the fishy or soapy smells from the timbers of other cases. Eggs absorb those foul odours through the pores of the shell, with the result that domestic cooking eggs are a source of complaint, not being equal in flavour and freshness to eggs, neither stale nor tainted, nor have they the bloom and taste of good fresh eggs.

DOMESTIC COOKING EGGS.

Being used principally for pastry, they could not be put on the table, and certainly would not suit all stomachs. To some folks an egg is simply an egg. "Eggs are eggs," but their flavour differs greatly. Whereas a Game hen's egg could not be relished by a bilious person, yet that person could enjoy a White Leghorn hen's egg. The delicious flavour and great richness of Muscovy ducks' eggs are due to the various foods they eat; yet, while many people cannot eat the Muscovy egg, they are able to appreciate that of the Indian Runner duck. The quality of all eggs may be affected, chiefly by the class of foods fed to the fowls, such as prickly-pear, green grass, sand, camphor laurel berries, tainted meats, or fishy diets; nevertheless, a limitation of those highly odorous foods may not injure their piquancy.

CASE EGGS.

They are those which are collected by hawkers or pedlars whose occupation takes them into the country, visiting farms and bartering merchandise or fruit for

eggs. Their devious routes usually take about a week to perform, the eggs being collected on both outgoing and returning trips. Consider what a shaking the first-bought eggs endure. Judge what their condition must be in from shocks and bumps encountered on the journey; likewise, the partial incubation during hot, sultry days, &c.

Farmers collect eggs for the next week's visit of the buyer. How happy they may be when a stolen nest is discovered, with a dozen or so of sun-baked eggs; all go to swell the bulk; small, dirty, brown or white eggs, kept in quarters not suitable for their preservation of freshness.

It is from this source that spring, summer, and autumn supplies glut the markets. However good the intent may be between the pedlar and farmer, the purchaser or consumer must not overlook the fact that EGGS are PERISHABLE. Should one happen to be rotten and break while in transit, the fumes therefrom are rapidly absorbed by the fresher ones. That odour seldom vanishes, and is easily detected.

DIRTY EGGS.

They are a source of contamination, as the glue or coating with which the hen seals the pores of her egg, just before laying, is destroyed by being smeared with foreign material, which allows entrance of bacteria, and those germs enter the pores of the egg, and this smearing soon spoils it. All dirty eggs must be washed, rubbing as little as possible, because the bloom is thus destroyed, leaving only an appearance like a stale egg; a good rule is—use the dirty eggs for home household purposes, rather than to market them and risk the spoiling of the consignment.

Eggs can be classified as "Farmers' Specials," "Special," "Fresh," "Extra Good," &c. Damaged ones are heated eggs in which the embryo has incubated, and subsequently died; shrunken air space, or the air cell has enlarged, and the moisture has evaporated, foretelling age. Small eggs, dirty, watery, blood rings, as well as three rots (black, white, and spotted), make eggs absolutely unfit for food. In marketing, grading for uniform shape, texture of the shell, weight (2 oz. average), and care in packing are leading features which govern the higher values. Avoid mixing wrinkled, cracked, thin-shelled, various shades of hue. Exclude all dirty ones, dented eggs, spotted, musty, blood rings, and rottens from a consignment. By so doing your product gets known among buyers and your labour rewarded.

HATCHING EGGS.

In the cold weather eggs chill quickly, and to prevent this they should be gathered often and kept in an even temperature of 60 or 70 degrees F. If kept for more than five or seven days they should be turned about twice daily. Some say that an egg should be put into an incubator fresh. This is a fallacy. Nature has provided that a hen should lay the batch that she is to brood; therefore, we know that the first egg laid gets cool, warmed, and again cooled by the repeated visitation of the laying hen. How long the egg will keep and still be good depends on care and also on constitutional vitality.

Breeders systematically use hatching eggs that are something less than ten days old. Setting eggs are picked, and should be of perfect egg shape, by which I mean short and round; extremely long, showing ridges or rings, rough, cracked, or any other malformed eggs are unsuitable. It pays to use only the choicest eggs for setting purposes (not a farmer's setting of prickly-pear, grass-fed, dung-heap fed birds), and expect to have standard progeny. Hence the tidal-wave of deterioration of poultry, and the reason why stud breeders of fowls and eggs obtain such high and fancy prices for their stock.

The foregoing was penned not in any sense to hurt any reader's feelings, but to lay bare true facts that happen from day to day in the marketing of our poultry produce.

It is the wise chap who carefully carries out many of the minor details, and who make a success of his enterprise, as in all walks of life a man must be adapted for his trade. All the money lavished to teach a girl the piano will not make her a pianist if the musical adaptability is lacking; likewise, dear poultry friends, the hen, turkey, duck, goose, or the fancy side of poultrydom must have personal adaptability and love of work. If these bumps of individualities are lacking, success may never be within reach of your desire to achieve success.

Poultry husbandry is not altogether a lazy or indolent proposition, being made up of so many little details, which constantly crop up on every side apart from the usual daily routine; and he who attends to every item in a large egg-producing business will ultimately prove successful.

FEATHER PULLING.

By R. T. G. CAREY.

Feather-eating or feather-pulling are twin brothers, and all sorts of theories have from time to time been advanced as to what really constitutes the complaint. Mr. R. T. G. Carey, Pindora Poultry Farm, Beerwah, has forwarded us this remedy, which, no doubt, will interest our poultry readers:—

The true cause of feather-eating or feather-pulling is really lice instead of vice. The discovery was made by the aid of a powerful mieroscope a few years ago. The Board of Agriculture of Great Britain emphasises the discovery, and has given full assurance that the true cause is *lice*. The leaflet issued by our brothers across the seas reads as follows:—

"Feather-pulling or feather-eating is due to a minute parasite (*Garcopis lævis*) at the roots of the feathers. As these mites live upon and irritate the roots of the feather quills, they are found in the white powdery matter at the quills' base. In relieving the irritation caused by these parasites, the birds frequently pluck out feathers. Hence the acquired habit."

The remedy is a change of quarters for the birds, with sulphur added to all food to cause moult. Then feed for new feathers. Should the habit, however, be too strong, then off with its head.

ERADICATION OF THE FOWL TICK.

The fowl tick concentrates on chickens, although it will also attack turkeys, geese, ducks, pigeons, ostriches, and guineas, the turkey ranking next to the chicken as a popular host. It wreaks destruction by reducing the vitality and condition of the birds as well as minimising egg production. Fowls raised where ticks are numerous are often stunted in growth. Another source of loss is desertion of the nests by setting hens, caused by annoyance from the ticks. Death often results in the case of heavy infestation, the parasites draining the fowls of blood and also poisoning them with certain secretions.

SOMETIMES IN THOUSANDS.

In some instances the ticks are so hungry and so plentiful that they swarm over the fowls by the thousands. The symptoms are usually weakness in the legs and droopiness of the wings, the chickens being unable to walk or even get up on the roost. The feathers appear ruffled, and there is usually a loss of appetite. The comb may or may not appear pale. Sometimes death occurs a day or so later. Chickens, soon after hatching, are often killed by becoming infested with ticks.

The chicken tick or "blue bug" is the bed bug of the fowl family. Usually its presence can be determined by examining the ends of the roosts or pulling up loose pieces of bark or boards about the roosts rather than by examining the fowls themselves. Ordinarily during warm weather the eggs hatch in from ten to fifteen days, while in cool weather the hatching period sometimes exceeds three months. The young ticks have six legs and are greyish in colour; they usually prowl about the roosts, searching for fowl upon which to prey during the night. They crawl up on the legs of the fowls and attach themselves on various parts of the body, especially where the feathers are not very dense. The ticks attach themselves in bunches on the host, and usually are concentrated on the breast, under the wings, and on the thighs and neck. They attach themselves very firmly by their spiny mouth parts and suck blood, usually continuing their blood feast for about a week or ten days. Then, blood gorged, they drop from the fowl and seek a secret hiding place. Four to nine days thereafter the seed ticks shed their skins and acquire an additional pair of legs as well as more size. Henceforward, they work entirely at night, hiding in crannies and crevices during the daytime. Following each of the first three meals of blood the skin is shed, and at the time of the last moult the adult males and females appear. After partaking of another meal of blood, the females are ready to lay eggs, the average production being 500 to 900 eggs a female.

PESTS LIVE FOR YEARS.

The longevity of the fowl tick is remarkable, as some of them have been known to live over two and a half years without any food, and unquestionably in infested chicken-houses many of them survive longer than this, even when all poultry is excluded.

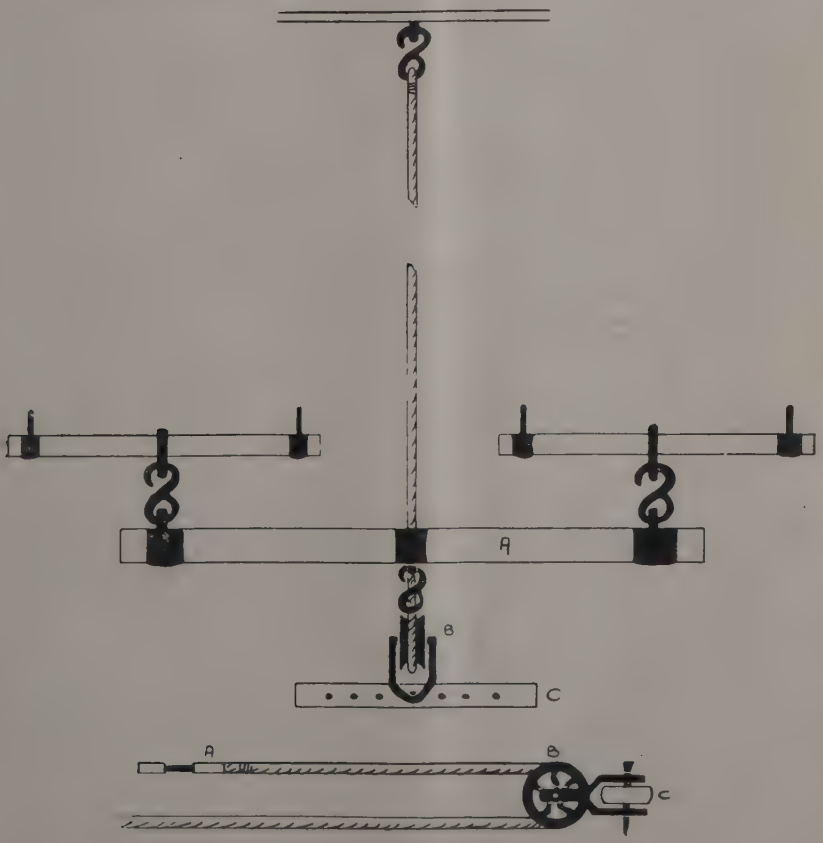
The rapidity of breeding depends largely upon the temperature. Hot dry weather apparently does not interfere with the development of the chicken tick; in fact, it appears to be at home under such conditions.

It is difficult to control fowl ticks by the use of chemicals, although two satisfactory solutions—carbolineum and petroleum—have been found to be effective. Carbolineum is more destructive to ticks than is petroleum. It persists longer and possesses the advantage of drying into the wood so as not to soil the fowls. Anthracene, which is the principal constituent of carbolineum, has been found to be about as effective as the latter material. The limiting factor here, however, is the difficulty of obtaining this material on the market. Creosote oil, containing 8 to 20 per cent. tar acids, is also very destructive to fowl ticks, but is difficult to use in a spray, owing to its caustic effects on the operator. When applied to the roosts and crevices with a brush, it destroys all ticks touched and persists well.

In eradicating ticks it is essential to destroy by fire all the infested material and other equipment which are not valuable.—"Weekly News Letter" of the Department of Agriculture, U.S.A.

TANDEM HITCH FOR TEAMS.

The accompanying sketch will show how the connection is made between the trace chains and swingle bars in the "Tandem Hitch for Teams," illustrated in the November issue of the "Journal":—



Horticulture.

THE GERBERA.

The following paper, by Mrs. Grenning, was read at the November Show of the Horticultural Society of Queensland:—

"The Gerbera is still a comparatively new flower to Queensland, having been introduced some eight or nine years ago from South Africa. The climate of Queensland appears to be well suited to the growth of this plant, and, as a result of cross-fertilisation and hybridisation (the former probably by bees and other insects), a wide range of delicate shades of colour has been secured. By reason of its attractiveness and general fine qualities, it has become so popular in this short time that practically every flower-garden has at least a few Gerberas; in fact, many do not consider their flower-garden complete without a number of them.

"Its popularity is undoubtedly well merited, for, first of all, the plant is a perennial, so that, instead of having to be renewed every year, it multiplies, in some cases, to quite a remarkable extent; then the flowers are very attractive by reason of their range of colour and size; moreover, the plants are in bloom nearly the whole year, and the flowers will last as long as three weeks in cool weather, and in the summer much longer than most flowers. Having very long stems, they are particularly well suited for table decoration.

"The first thing for the beginner to do is to get an initial stock of good seeds or plants. Plant in spring or autumn, preferably in spring, because the plants make very little growth during winter. The seeds will germinate at any time except May to August, when they are very inactive, and if sown during this period will usually lie dormant for some time. One batch of seeds I sowed in May last year did not come up until August. The seeds should not be kept any length of time before sowing, but should not be sown until properly ripe. If kept for more than four months, very poor result will follow. Seeds with holes in are usually of little value, but I have had cases of such seeds germinating with holes in the leaves. To sow the seeds, make the soil uniformly fine and lay the seeds on their sides about 1 inch apart. The seeds sprout from just below the hairy end, so that in order to get the best results they should be sown the way they stand in the seed head, but good results will follow either method. Cover the seed lightly with fine soil and protect with grass or a piece of hessian. Keep the latter moist until the plants show above the soil. The best method to follow is to sow the seeds in the open—in a suitable spot to receive the morning sun. I have always had good results by following this practice; for, if sown close together in a shallow seed pan, the roots are prevented from spreading naturally, they become entangled, and the plant is stunted. In one instance last season I obtained 32 plants from a head of 40 seeds sown in the open beside the plant from which the seed was taken.

"The seedlings can be transplanted very early, even when only getting the third leaf; the earlier the better, for the plants always grow much better when given plenty of room. Of course, care has to be exercised with very small plants.

"Plants of the same age vary considerably in some cases, due to the time when they were planted and to the nature of the plant. Some plants are naturally very slow growers, while others grow with remarkable rapidity. The size of the flower does not depend upon whether the growth is vigorous or not. I have had flowers varying in size from 2 inches to 5½ inches diameter; and my best one is one of the strongest growers. However, the most vigorous growers usually bear a small flower in larger quantity, and are much better for market purposes; whilst the larger blooms, produced in smaller quantities, are best for show purposes.

"Dead stalks and dead flowers should always be removed, for if they are not, the flowers coming up are very often malformed.

"A seedling will sometimes give very faulty flowers at first, but often these improve and later on become perfect blooms. If such a seedling gives very small blooms, it would be advisable to remove it; if it is a fair size, but does not improve with time, throw it over the back fence. By having a garden full of perfect blooms you can be sure of getting good results from your seeds, but, on the other hand, a number of faulty blooms will give faulty seedlings.

"From the original two dozen seeds I planted I secured three distinct colours, and from these and a few others added since I now have a large number of shades—some being much better than the originals, simply by removing all plants yielding deformed flowers.

"Most of my flowers are semi-double. These are best for show purposes, for, if a few petals are faulty, they can be removed and so improve the appearance of the flower. The single variety cannot be improved in this way.

"Dividing is perhaps the most important factor in the cultivation of the Gerbera. The stronger growing plants must be divided every year, or else the plants become choked and the size and number of the flowers decrease. Some do not require to be divided for some years. As an example, to show the variation in the growth of different plants, I raised a number of seedlings in the same bed and under exactly the same conditions. When they were not quite a year old I divided those requiring division. One seedling was divided into fourteen separate plants, while some of the seedlings could not be divided.

"The plants can be divided at any time except during the winter months. Plant at least 18 inches apart to allow plant to spread.

"If the plants begin to wither and die, they have either been too long in the one spot or else their roots are diseased. To save the plants, divide at once, and replant in fresh soil. If the roots are very long, cut them off to 5 or 6 inches before replanting. In the case of diseased roots, cut the offenders off, divide, and replant, and the plants will thrive again. I have never lost any plants, if withered, when treated in this way. Plenty of soapy water keeps the plants clean, and none that have had this treatment have suffered with diseased roots.

"Vigorous growers require plenty of manure and water, and the ground must be well drained.

"When the blooms are picked during the day they invariably close in the evening. Blooms to be shown in the evening should always be gathered one, or in some cases two, days before the show. Another point—colours appear quite different at night, so to match and select colours for night show they should always be compared on the preceding night. I have one variety the flowers of which keep open on the night of the day on which picked, but all the others should be gathered at least one day earlier.

"To collect your own seeds, pick the stalk when the flower is dead, and put away in a box for two or three weeks for the seeds to mature. Then pick the seeds out and sow as soon as convenient."

A NEW COTTON AS A SUBSTITUTE FOR SEA ISLAND COTTON.

Owing to the ravages of the boll weevil in the United States of America, the production of Sea Island cotton in that country has seriously declined; and the opinion of the United States Department of Agriculture, based on the very rapid decline in production during the past two years, is that Sea Island cotton may be doomed.

The "Weekly News Letter" issued by the Department says that, for the ten years ending in 1916, the average annual production of Sea Island cotton was about 90,000 bales. The production in 1918 was only about 40,000 bales; and the estimates for 1919 are as low as 20,000 bales.

Without Sea Island cotton, many industries will be seriously crippled; if, indeed, they are not destroyed, and many planters will lose the major part of their income—unless some other variety of cotton of equally long staple and high quality and more nearly immune from boll weevil attack is generally accepted and grown in the Sea Island districts of the South-eastern United States.

There is such a variety of cotton. It is known as Meade cotton, and was originated by the Bureau of Plant Industry, United States Department of Agriculture.

It is as fine as Sea Island cotton and as long. It can be handled on the regular Sea Island gins. It makes profitable yields under boll weevil conditions.

But—will the planters and ginners take sufficient interest and co-operate closely enough to ensure the continued production of an ample supply of pure Meade seed? Upon the answer to that question, in the opinion of the Department, depends the solution of the problem.

Of the 3,000 acres of Meade cotton growing this year, not more than 500 acres can be safely reported as pure stock. In order to keep it pure, no other variety of cotton must be planted in the same neighbourhood. The Department of Agriculture is encouraging communities of farmers to organise for the purpose of growing only the Meade cotton and of keeping up the standard by continued selection and careful ginning.

Tropical Industries.

THE SUGAR INDUSTRY AT MACKAY.

The General Superintendent of the Bureau of Sugar Experiment Stations has returned from the Mackay district. Reporting upon the general appearance of the town and district, Mr. Easterby stated that the business portion of the township had by now been largely repaired, and the celerity with which premises had been rerooted and restored to their normal appearance was little short of marvellous, taking the scarcity of buliding materials into account. The sound of hammer and saw could be heard everywhere. The streets had been thoroughly cleaned up, and the greatest credit was due to the authorities for the present clean and sanitary appearance of the town.

The residential part of Mackay had also to a large extent been repaired; but many houses still present a desolate appearance, with their roofs off and walls collapsed, exposing the furniture within to the elements. The terrific rainfall which continued for three days after the cyclone, amounting to 55½ in., did irreparable damage to the household goods of those unfortunates whose houses were unroofed or walls blown in. Many dwellings were blown clean off their blocks, but are still inhabited. In other cases the blocks gave way and the houses gently slid to the ground, or the blocks have come up through the flooring. The courage displayed by the people of the Mackay district in meeting the disaster and restoring their premises and carrying on their usual avocations is beyond praise and characteristic of the people of North Queensland, whom no flood or cyclone seems able to terrify. This is one of the reasons why the sugar-growers of North Queensland deserve every consideration and sympathy from the consumers in the more Southern parts of Australia. In order to settle the Northern littoral and produce sugar for Australia, canegrowers must always face the risks of cyclone and flood. The damage along the river front is, of course, the first thing that strikes the eye of the present visitor to Mackay; the partly broken wharves, the steamers sunk or driven ashore, and the disaster to the bridge are all visible as the tender advances from Flat-top up the river; but the streets have resumed their wonted activity, and business is being carried on as usual.

Many of the farmers' residences and all the mill buildings in the outlying district suffered damage to a greater or less extent, and will require a good deal of expenditure to refit them; but this work is for the most part being undertaken as rapidly as possible. A large number of country dwellings have been put in order again; but the outbuildings, such as sheds and stables, have been left to later on. Practically every windmill in the district was blown over, and a considerable number of tanks also. Coming to the damage to the growing crops of cane, Mr. Easterby said that the most serious damage done appeared to be confined to the area within about 9 miles of town. Thus at the Sugar Experiment Station, 3 miles out, fully 50 per cent. of young cane was literally snapped off on two or three plots, while more advanced cane stood the blow better. Around the Racecourse the damage to cane on many farms would vary from 10 per cent. to 50 per cent. on an average.

Cane at the Palms Plantation had also been much knocked about and destroyed. Farther along the line to Finch Hatton, the crops appeared to have weathered the storm well; and good reports were received from most of the areas at McGregor's and Owens Creek. On the Homebush area, while individual farms suffered, the loss was not as severe as nearer Mackay. At North Eton the crops were fair to good, and the damage not very great. As far as possible, the General Superintendent visited nearly every sugar-growing area; and from a personal inspection of the greater part of the cane in the district he is inclined to put the average loss of cane at 20 per cent. to 25 per cent. at the present moment. The enormous rainfall from 1st January to 13th February—viz., 91½ in.—undoubtedly had a large influence in checking the growth of cane which was not nearly so forward as it should have been, apart from the damage caused by the cyclone. An estimate of damage to cane by such a furious cyclone is difficult to estimate; and it may be that such estimate will require revising a few weeks later on. In any case the present season at Mackay was not going to be a record such as last year. During the week ended 23rd February the weather was extremely hot and fine, and it was wonderful how rapidly the cane picked up during that time. The cane is rapidly making new leaves, and now presents a much more attractive appearance than it did even so recently as three weeks ago. Of course, this making of new leaves must be at the expense of the cane plant, and will, no doubt, retard growth for a while. When the cane is snapped off, there can be no recovery for the season; and where canegrowing land has been completely washed away, as it has

been in some instances on the river and creeks, the loss is a total one. All these hit the individual very hard; but the collective loss will not be so great as originally anticipated.

Crops showing about 1 ft. to 2 ft. of cane appeared to suffer most. The late-cut ratoons were scarcely injured, and the longer cane bent more successfully to the wind's fury and was laid over flat, from which position it has now for the most part recovered. The variety that was most injured was H.Q. 426, or Clark's Seedling, a cane of high sugar content. D. 1135 and 1900 Seedling stood well, as did also Malagache in some districts.

THE SUGAR INDUSTRY IN THE NORTH.

The General Superintendent of the Bureau of Sugar Experiment Stations has returned to Brisbane from an official visit to the Sugar Experiment Stations at Mackay and Innisfail and the Entomological Bureau at Meringa, near Cairns. The continued drought is giving rise to a good deal of anxiety, and, though some little rain has fallen at Mackay and Cairns, it is quite insufficient to do more than freshen up the cane. At Mackay the late-planted cane was continuing to hold out well and looked remarkably well in places. Should rain continue to hold off, however, the condition of the cane will become serious as it advances in growth and makes a greater demand upon the soil moisture. The crushing of the present season's crop is now drawing to a close, and it is anticipated that the yield will only amount to some 35,000 tons of sugar. The density in the cane or commercial cane sugar has been exceedingly high this season; but it is freely stated that relatively less sugar has been extracted this year, the difficulties of manufacture being greater, owing to some unknown reason. The dry nature of the cane may be the cause, or there may be other bodies present affecting the polariscope. It is a subject for chemical investigation. The work of the Sugar Experiment Station was being carried on satisfactorily, and the new varieties were making good headway in spite of the dry weather. New tests were initiated for the succeeding season's work, including chemical and commercial trials of foreign canes. The Laboratory is being kept employed in the analyses of canes, fertilisers, and soils.

The Innisfail district is much drier than it has been for years, and beyond a few light showers no rain of any value has fallen for some months. This, however, up to the present, has given farmers a fine opportunity to harvest the crop and ratoon it, to plant next season's cane, and thoroughly cultivate the land. The whole of the district looks beautiful at the present time; the young plant cane has struck well; and there is almost a total absence of weeds. The young cane is now in a great position to respond vigorously to the first rains.

The cane planted at the new station has germinated beautifully, and the whole place looks a picture. The varieties are coming along splendidly. Due to the difficulties of shipping, fertilisers are very hard to procure; and the experiments in this direction are now awaiting manures, which are very slow in coming to hand. Goondi Mill was to close down on the 3rd of this month, Mourilyan on the 17th, and South Johnstone may go on till early January. The season has been satisfactory at all three mills, and the commercial cane sugar has been high throughout.

The Cairns district was also looking well, but further rain is here needed badly. Babinda Mill will crush into January; while Hambledon and Mulgrave are expected to finish before Christmas. The crushing at these mills has been satisfactory. Farmers are taking advantage of the crushed limestone being turned out by the Government at Chillagoe. Large quantities are being ordered, the price being 25s. per ton on trucks at Chillagoe.

Reports from the Lower Burdekin indicate that, although fair to good rains have been experienced recently, a good deal more is wanted.

The early-planted cane in the Herbert River is also stated to be suffering from abnormally dry weather.

At Bundaberg the rains that fell about six weeks ago were useful in inducing a good strike of cane, but further rains are now urgently required.

Given good rains immediately and no floods or cyclones, there should be an excellent crop north of Townsville next season.

Forestry.

CONSERVANCY OF OUR FORESTS, No. 2.

By THE EDITOR.

In continuation of our introductory article on the subject of our Queensland timber resources, we will consider the rate of growth of some of our soft-wood timber trees.

Previous to the year 1879, extirpation had been going on for a long series of years, and little anxiety had been felt as to future supplies. In 1879, however, action was taken by the Government, when certain regulations were issued defining the diameter of kauri and hoop pine which it would thenceforward be legal to cut.

Those first regulations, then promulgated by the Lands Department, prohibited the cutting down of any pine tree having a less diameter than 3 ft. It will not be matter of surprise to those who know anything of timber-getting at the present day, that such a regulation should have caused consternation and a general outcry amongst the timber-getters.

Leaving kauri pine out of the question, it is well known that not much hoop pine attains a diameter of 3 ft. even in the most favoured localities. And when we consider that large quantities of this valuable timber grow (or should we say "formerly grew"?) in stony and clayey mountain scrubs, with bleak aspects, it may well be imagined that, there, a diameter of 2 ft., will be seldom exceeded. Trees of 3 ft. diameter are few and far between, and often, when they were obtained, they were found "pipey,"* or else at such a distance from a mill or navigable water as to render them of no value to the timber-getter, who would have to expend more in transporting the logs to a market than he would obtain for them on arrival.

The late Mr. Turnbull, who, at the time I am writing of, was a surveyor at Mooloolah, and had ample opportunities of seeing the operations of the timber-getters, assured me that he had seen trees there of hoop pine which had attained a diameter of 3, 4, and even of 6 ft. These were not numerous; but there is the fact that, in certain favourable situations, the hoop pine will attain very large dimensions.

Against this, a Pine Mountain timber-getter informed me that the largest pine-tree in that locality would not measure 2 ft. in diameter, whilst, taking the average of what had been cut there, it would be found to be not over 18 in.

Now, about the rate of diametric growth. The hoop pine increases at the rate of ¾ in. per annum, and will top the scrub at a diameter of 10 in., thus following the example of the kauri in seeking the light before increasing in diameter.

The kauri pine makes little wood until it has shot up so as to top the rest of the scrub. If the other scrub timber be short, so will be the kauri; on the other hand, if the surrounding scrub be high, the kauri will likewise be lofty; and it is in the latter description of scrubs that the best timber is obtained. Now, by the time a kauri sapling is 12 in. in diameter, it has done all its upward growth. From this period the yearly growth is from 5 to 9 in. in circumference. Instances have been known, and can be verified, of an annual growth of 12½ in. in circumference; but, of course, a great deal depends upon the seasons—a warm, rainy season being the most favourable. This rate of growth is maintained pretty evenly until the tree reaches from 40 to 50 in. in diameter, when the growth slackens off, but does not cease.

The kauri, at this latter stage, seems to have attained maturity, the timber being more durable, less liable to flaws, and far more profitable for all parties concerned in its working.

The red cedar makes three growths, equivalent to an increased diameter of 2 in. every three years.

---

* On a large timber reserve at the mouth of the Maroochie River, the late Mr. W. Pettigrew, in 1897, measured some pine trees, and found them to be 18 ft. in girth at 5½ ft. from the ground. These large trees were straight for 40 ft., but were "pipey." He reckoned the rate of growth at about 1 in. per annum in girth.

Now, to apply these figures. To cut the kauri pine on its attaining a diameter of less than 3 ft. is a most disastrous policy, as the following figures (which can easily be verified by anyone accustomed to timber measurements) will show:—

Taking the length of a tree at 60 ft., and considering the circumference as three times the diameter for practical purposes, we find that such a tree at—

Diameter. Inches.	Circumference. Inches.	Side of Square. Inches.		Superficial Feet.
20	60	= 15	will yield	1,124
24	72	= 18	will yield	1,620
36	108	= 27	will yield	3,644
48	144	= 36	will yield	6,480
60	180	= 45	will yield	10,124
66	198	= 49, 50	will yield	12,124

Thus, a tree, which at 2 ft. diameter would yield 1,620 superficial feet of timber, would, if allowed to grow five years longer, yield 3,644 ft., or, in other words, it would be worth over double the money; and, if allowed to grow for ten years, would yield exactly four times the amount of timber which a diameter of 2 ft. would yield.

On the first supposition—or, say that a tree requires six years to increase from 2 ft. in diameter to a diameter of 3 ft.—we have a direct gain of 125 per cent., equivalent to 21 per cent. per annum. In a less degree, the above will apply to hoop pine, beech, and cedar.

I now come to the question as to the quantity of timber, or rather, as to the number of 40-ft. logs, which a mill, cutting its 100,000 ft. (log measurement) weekly, would require annually to keep it in full work. The following table will show this distinctly:—

20 inches diameter	4,194 logs
24 inches diameter	2,911 logs
36 inches diameter	1,303 logs
60 inches diameter	631 logs
66 inches diameter	597 logs

A well-known Brisbane sawmiller said: "I have counted up the sizes of 1,022 logs (not trees) cut at the Mooloolah sawmill lately, and they were:—Under 20 in., 400; 20 in. to 24 in., 365; 24 in. to 36 in., 192; above 36 in., 5."

Taking the average number of the logs, the two estimates do not materially differ.

Taking into consideration the number of sawmills in the State, how long will it be before our scrubs will be denuded of soft timber, and our forests of hardwoods, at this rate of working? Our timber lands, extended though they may be, are not inexhaustible. America and Canada have long since discovered that these vast forests have limits. Yet a journey may be made from Patagonia, the extreme limit of South America, to the Arctic Circle in North America, a distance of nearly 9,000 miles, without leaving the forests; and, further north, the Arctic pine forests stretch in an almost continuous belt through three-quarters of the world, with a breadth of from 1,000 to 1,400 miles, almost wholly composed of conifers, such as the Siberian Fir (*Abies siberica*), Larch (*Larix siberica*), *Pinus umbra, Picca olovalate,* &c.

The area of the Queensland forests, as given in the Official Year Book of the Commonwealth of Australia, 1901-1918, is 1,142,885 acres permanent and 2,804,967 acres temporary reserves, the total forest area amounting to 40,000,0000 acres; but the actual area of wooded land is probably, in the case of all the States, much greater than is here shown, as considerable areas not included as forest lands in the estimate possess timber of local value. From this point of view, the area of wooded land in Queensland may be estimated at 143,000,000 acres. There were, in 1917, three State forest nurseries covering 15 acres, and three plantations with an area of 100 acres; but we have no statistics as late as 1919. The revenue of the State Forestry Department in 1917-1918 amounted to £66,660, and the expenditure totalled £13,930. To show the extent to which our forests have been depleted, consider the quantities of local timber sawn or hewn in the State during the years 1913-1917:—

Year.	Superficial Feet.
1913	156,634,000
1914	168,456,000
1915	144,950,000
1916	121,850,000
1917	111,663,000
Total	703,553,000

No satisfactory estimates of the total value of the forest production of the State are available; nor can we form any idea of the value of trees cut down and abandoned by splitters, nor of the tops of trees left in the forests and scrubs, nor of the thousands of trees stripped of their bark and dying in consequence, nor of the enormous waste resulting from sleeper-getting, shingle and rail splitting. As far as exports and imports of timber from and to the Commonwealth are concerned, these have run into many millions of feet, dressed and undressed. In 1913 the value of imported timber was £2,926,476, declining between that year and 1918 to £1,406,582; and exports during the same years totalled, respectively, £1,011,041 and £247,056.

Now, concerning the machinery employed in dealing with a considerable portion of the log timber. Taking forest and other sawmills and factories in Queensland, we have the following particulars up to the year 1917:—

Number of factories 287, employing 4,015 persons. Horse-power of engines used, 8,932; value of plant, £448,423; amount of wages paid during the year, £467,108; value of material worked up, £690,490; value of the output £1,461,557.*

Let us here consider how our forests were depleted between the years 1913 and 1917. In that time the timber sawn and hewn, leaving out waste, amounted to 703,553,000 superficial feet. Supposing that a log 60 ft. in length and 2 ft. in diameter will yield 1,620 superficial feet, then it is clear that the number of logs required to produce that quantity of saleable timber would be 4,323,181. What has been done to replace this wealth of timber trees?

There is an even more important aspect of the forestry business, and that is the destruction of the forests by cutting immature timber. Day after day, the railways are bringing in truck loads of pine from 10 to 12 in. in diameter. Hundreds of such soft-wood saplings are sent to market; and not only is this the case with pine trees, but also with hardwood, owing to the demand for telegraph poles, stumps for house building, &c.—necessities which have to be supplied, and which could be perpetually supplied if only care were taken to plant young trees in their places. This is certainly being done in some districts, but it should have been thought of fifty years ago. Some years ago I was in the Black Forest (Schwartz Wald), in the Grand Duchy of Baden, Germany. It is well named the "Black" Forest, for it is a grand forest of pine trees, from which supplies of timber have been obtained for generations; yet the forest is apparently inexhaustible, and thousands of splendid trees darken its avenues. Whenever trees are felled, others are planted in their places, so that the supply is always kept up. In Queensland, many trees have been planted in the Northern scrubs—pine, beech, red cedar, and silky oak; the latter a tree which has been ruthlessly destroyed for the purpose of making banana crates. Much has also been done in the way of tree-planting on Fraser's Island, Wide Bay; but much remains to be done in the Northern scrubs to replace the fine cedars and beeches, which have been exploited almost to extinction.

Posterity has naturally done nothing for the present generation, but it is a duty devolving on the latter to provide timber supplies for those who come after us.

This subject will be further dealt with in future issues of the Journal, space permitting.

FORESTRY IN THE UGANDA PROTECTORATE.

The British East African Protectorate lately created a separate Forestry Department. Before this—1917-1918—the interests of Botany and other scientific subjects were included in one Department; but at the beginning of that financial year a separate Department was created, with Mr. R. Eyffe as Chief Forest Officer, who has now issued the first Annual Report on the Forestry Department for the year ended 31st March, 1918.

The work of the year was largely of a preparatory nature, including surveys, the construction of roads, the erection of buildings, a sawmill, and other work necessary to facilitate future operations. Time was, however, found to clear 170 acres of ground on a Railway Fuel Reserve, and to plant it with 820,000 young trees; to start an arboretum and nursery; to collect and distribute 697 lb. of tree seeds; to advance work connected with a forest herbarium and museum; and to collect 500 lb. of rubber in the Budongo Forest. The rubber reserves of this forest are to be developed. Of timber trees, in addition to those mentioned, *Markhamia* (*Dolichandrone*) *platycalyx*, one of the best timbers of the region, 10,000 of other species were planted. Of introduced trees, Teak and *Eucalyptus* spp. are making rapid growth.—"Bulletin of the Royal Botanic Gardens, Kew."

* Since this was written, we have received the annual report of the Director of Forests, and in a future issue of the Journal any discrepancies will be corrected and figures brought up to date.

Botany.

FLORA OF THE BUNYA MOUNTAINS.

By C. T. WHITE, F.L.S., Government Botanist.

In September-October I had the privilege of spending a week on the Bunya Mountains with the members of the Royal Australian Ornithologists' Union on the occasion of their annual reunion and camp-out; and the following account of the flora of the mountains has been compiled from specimens gathered on that occasion. It does not profess to be complete, as visits at different times of the year, and to spots additional to those visited by the members of the Union, would no doubt add considerably to the list. It should, however, give a fair idea of the flora of the locality, and, further, give botanists an idea of what additional species are likely to be met with. Only those plants growing on the higher parts of the mountains, at an altitude of 2,000 ft. and over, are listed. For the sake of convenience the classification and nomenclature of Bailey's "Queensland Flora" has been adhered to, even in the case of the ferns.

ACKNOWLEDGMENTS.

The specimens were mostly personally collected, but help was received from other members of the party, and in this respect acknowledgments must be made to Dr. J. Burton Cleland, Mr. H. Tryon, Mr. H. W. Andrew, and Dr. and Mrs. Price for specimens which helped to swell the following list.

Most of the specimens have been worked out by my assistant, Mr. W. D. Francis, and my thanks are due to him for the care taken over the matter. For the identification of one Eucalypt (*E. tereticornis*) I am indebted to Mr. J. H. Maiden, I.S.O., F.R.S., Director of the Botanic Gardens, Sydney, and for the two Loranthaceæ recorded to Mr. W. F. Blakely, Botanical Assistant, Botanic Gardens, Sydney.

GENERAL ACCOUNT.

On the Bunya Mountains, four main types of vegetation are met with, all very sharply defined the one from the other—(*a*) the open grass lands; (*b*) open forest; (*c*) dense rain forest, popularly known in Queensland as "scrub"; and (*d*) the swamps. The open grass land is mostly characteristic of the bald hills, such as Mowbullan, covering their tops and the slopes for a considerable area. They give a very beautiful and park-like appearance to the vegetation, backed up as they are by the solid wall of timber of the "scrub." Among the grasses are found different smaller flowering plants, such as *Mentha saturcioides* (Pennyroyal), *Craspedia Richea* (Billy Buttons), *Viola betonicæfolia* (Violet), *Galium Gaudichaudii*, *Helichrysum apiculatum*, *H. bracteatum*, *Helipterum anthemoides* (Everlastings), *Wahlenbergia gracilis* (Blue-bell), *Acæna ovina*, *A. sanguisorbæ*, &c. Isolated trees are found, principally *Acacia decurrens var. pauciglandulosa* (Green Wattle) and *Eucalyptus tereticornis* (Blue Gum).

The open forest has a limited tree flora, the principal species being *Eucalyptus tereticornis*, *E. eugenioides*, *Sterculia diversifolia*, *Exocarpus cupressiformis*, *Angophora intermedia*, *Canthium buxifolium*, *Myoporum acuminatum*, and *Casuarina torulosa*.

The rain forest or "scrub" is, of course, botanically, the richest type of plant association on the mountains. The outstanding tree is the "Bunya Pine" (*Araucaria Bidwillii*). In places, this species is replaced by the "Hoop Pine" (*Araucaria Cunninghamii*), and as both trees occur in abundance they give a most characteristic appearance to the vegetation of the mountains which well warranted the old title for them of Araucaria Ranges under which locality name are recorded a number of Baron von Mueller's specimens collected there in 1856. A tree attaining large dimensions is *Elæocarpus Kirtonii*, *F. v. M.* Locally it is known as "White Beech" or "Mowbullan Whitewood," and in some of the scrubs occurs in such abundance as to warrant them being called "Beech Forests" by the timbergetters, surveyors, &c. It is a large tree with a smooth white barrel of very characteristic appearance. One of the tallest trees in the scrub, but slender-stemmed in comparison, is *Acacia Maidenii*, in the heart of the scrub it is rare, but is very abundant on the edge bordering the grass and open forest land; in the latter situation it does not attain any great height, but branches out into a fairly dense bushy tree. *Geijera Muelleri* and *Pittosporum undulatum* are two very abundant trees; both were in full flower at the time of our visit.

The swampy areas are relatively only small patches. The dominant plants are *Ranunculus rivularis var. major, Lythrum salicaria, Sium latifolium, Hydrocotyle vulgaris, Phragmites communis, Pennisetum compressum,* and a large sedge (not in flower at the time of our visit and therefore undeterminable).

LIST OF PLANTS COLLECTED.

RANUNCULACEÆ.

Clematis glycinoides, *DC.*
Clematis glycinoides, *DC.*, var. submutica, *F. v. M.*
Ranunculus lappaceus, *Sm.* Common Buttercup.
Ranunculus rivularis, *Banks and Sol.*, var. major, *Benth.* Swamp Buttercup.
Ranunculus parviflorus, *Linn.*, var. australis, *Benth.*

MENISPERMACEÆ.

Legnephora Moorei, *Miers.*
Stephania hernandiæfolia, *Walp.* Tape Vine.

CRUCIFERÆ.

Lepidium ruderale, *Linn.* Wild Cress.

CAPPARIDEÆ.

Capparis nobilis, *F. v. M.* Wild Lemon.

PAPAVERACEÆ.

Papaver horridum, *DC.* Native Poppy.

VIOLARIEÆ.

Viola betonicæfolia, *Sm.* Wild Violet.

PITTOSPOREÆ.

Pittosporum undulatum, *Vent.*
Citriobatus pauciflorus, *A. Cunn.* (?). Leaves only.
Citriobatus multiflorus, *A. Cunn.*, var. linearis, Bail.

POLYGALEÆ.

Polygala japonica, *Houtt.*

CARYOPHYLLEÆ.

Cerastium vulgatum, *Linn.* Mouse Ear Chickweed.
Stellaria glauca, *With.* Starwort.

MALVACEÆ.

Abutilon oxycarpum, *F. v. M.*

STERCULIACEÆ.

Sterculia discolor, *F. v. M.*
Sterculia diversifolia, *G. Don.* Kurrajong.
Tarrietia argyrodendron, *Benth.* Stavewood.

TILIACEÆ.

Elæocarpus Kirtonii, *F. v. M.* Mowbullan Whitewood.

GERANIACEÆ.

Geranium dissectum, *Linn.*, var. australe, *Benth.*

RUTACEÆ.

Melicope erythrococca, *Benth.*
Evodia micrococca, *F. v. M.*
Zanthoxylum brachyacanthum, *F. v. M.* Satin Wood.
Geijera Muelleri, *Benth.* One of the commonest trees in the scrub.
Acronychia lævis, *Forst.*

MELIACEÆ.

Amoora nitidula, *Benth.*
Cedrela toona, *Roxb.*, var. australis, *C. DC.* Red Cedar.
Flindersia collina, *Bail.* Broad-leaved Leopard Wood.

OLACINEÆ.

Villaresia Moorei, *F. v. M.* Churnwood.

CELASTRINEÆ.

Celastrus australis, *Harv.*
Celastrus bilocularis, *F. v. M.*
Denhamia pittosporoides, *F. v. M.*

RHAMNACEÆ.

Alphitonia, sp.

AMPELIDEÆ.

Vitis antarctica, *Benth.*
Vitis nitens, *F. v. M.*
Vitis acris, *F. v. M.*
Vitis clematidea, *F. v. M.*
Vitis hypoglauca, *F. v. M.*

SAPINDACEÆ.

Diploglottis Cunninghamii, *Hook. f.* Native Tamarind.
Cupania xylocarpa, *A. Cunn.* A Foam Bark.
Nephelium semiglaucum, *F. v. M.*

ANACARDIACEÆ.

Rhodosphæra rhodanthema, *Engl.* Deep Yellow Wood.
Euroschinus falcatus, *Hook. f.* A Maiden's Blush; Ribbon Wood.

LEGUMINOSÆ.

Lespedeza cuneata, *Don.*
Hardenbergia monophylla, *Benth.* Trailing Sarsaparilla.
Derris oligosperma, *Schum. et Lauterb.* Fish Poison Vine.
Castanospermum australe, *A. Cunn.* Black Bean Tree; Moreton Bay Chestnut.
Acacia Maidenii, *F. v. M.* Sally Wattle.
Acacia decurrens, *Willd.*, var. pauciglandulosa, *F. v. M.* Green Wattle.

ROSACEÆ.

Rubus moluccanus, *Linn.* Native Raspberry.
Rubus parvifolius, *Linn.*
Rubus rosæfolius, *Sm.* Rose-leaf Raspberry.
Acæna ovina, *A. Cunn.*
Acæna sanguisorbæ, *Vahl.*

CRASSULACEÆ.

Tillæa verticillaris, *DC.*

HALORAGEÆ.

Haloragis sp. (leaves only).

MYRTACEÆ.

Angophora intermedia, *DC.* Apple Tree.
Eucalyptus eugenioides, *Sieb.* White Stringy Bark.
Eucalyptus tereticornis, *Sm.* Queensland Blue Gum.
Myrtus Hillii, *Benth.* Scrub Ironwood.
Eugenia spp. 2 (leaves only).

LYTHRARIEÆ.

Lythrum salicaria, *Linn.* Purple Loosestrife.

ONAGRARIEÆ.

Epilobium Billardierianum, *Ser.*

PASSIFLORACÆ.

Passiflora Herbertiana, *Lindl.* Wild Passion Vine.

CAPRIFOLIACEÆ.

Sambucus xanthocarpa, *F. v. M.* Elderberry.

UMBELLIFERÆ.

Hydrocotyle vulgaris, *Linn.* Pennywort.
Apium leptophyllum, *F. v. M.* A Wild Carrot.

ARALIACEÆ.

Panax elegans, *F. v. M.* Celery Tree.

RUBIACEÆ.

Canthium buxifolium, *Benth.*
Morinda jasminoides, *A. Cunn.*
Psychotria daphnoides, *A. Cunn.*
Galium Gaudichaudii, *DC.*

COMPOSITÆ.

Brachycome microcarpa, *F. v. M.*
Olearia stellulata, *DC.*
Olearia elliptica, *DC.*
Vittadinia australis, *A. Rich.*
Helipterum anthemoides, *DC.* White Everlasting, Daisy.
Helichrysum bracteatum, *Willd.* Yellow Everlasting.
Helichrysum apiculatum, *DC.*
Cassinia quinquefaria, *R. Br.*
Acomis rutidosis, *F. v. M.* (?). Leaves only.
Craspedia Richea, *Cass.* Billy Buttons, Bachelors' Buttons.
Podolepis acuminata, *R. Br.*
Cotula australis, *Hook. f.*
Erechthites Atkinsoniæ, *F. v. M.*
Erechthites arguta, *DC.*
Erechthites quadridentata, *DC.*
Senecio amygdalifolius, *F. v. M.*
Senecio lautus, *Forst.*, var. lanceolatus, *Benth.*
Picris hieracioides, *Linn.*
Sonchus oleraceus, *Linn.* Sow Thistle.

STYLIDEÆ.

Stylidium graminifolium, *Sw.* Jack Jumper.

GOODENOVIEÆ.

Velleia paradoxa, *R. Br.*

CAMPANULACEÆ.

Wahlenbergia gracilis, *A. DC.* Blue Bell.

EPACRIDEÆ.

Lissanthe strigosa, *R. Br.*

MYRSINEÆ.

Myrsine variabilis, *R. Br.*
Embelia australiana, *Benth.*

EBENACEÆ.

Diospyros australis, *Benth. & Hook.*

STYRACACEÆ.

Symplocos Thwaitesii, *F. v. M.* (?). Leaves only.

OLEACEÆ.

Jasminum racemosum, *F. v. M.*
Notelæa longifolia, *Vent.*

APOCYNACEÆ.

Carissa ovata, *R. Br.*
Alyxia ruscifolia, *R. Br.*, var. pugioniformis, *Bail.*
Alstonia constricta, *F. v. M.* Tonic Bark.
Lyonsia reticulata, *F. v. M.* Monkey Vine.

ASCLEPIADEÆ.

Tylophora grandiflora, *R. Br.*
Marsdenia rostrata, *R. Br.*

BORAGINEÆ.

Cynoglossum latifolium, *R. Br.*
Cynoglossum suaveolens, *R. Br.* Forget-me-not.

CONVOLVULACEÆ.

Ipomœa plebeia, *R. Br.*

SOLANACEÆ.

Solanum aviculare, *Forst.* Kangaroo Apple.
Solanum discolor, *R. Br.*
Solanum stelligerum, *Sm.* Devil's Needles.
Solanum furfuraceum, *R. Br.*
Solanum cinereum, *R. Br.*

BIGNONIACEÆ.

Tecoma australis, *R. Br.* Wonga Vine.
Tecoma jasminoides, *Lindl.* Leaves only.

ACANTHACEÆ.

Eranthemum variabile, *R. Br.*

MYOPORINEÆ.

Myoporum acuminatum, *R. Br.*

VERBENACEÆ.

Spartothamnus junceus, *A. Cunn.*
Verbena officinalis, *Linn.* Common Verbain.
Clerodendron tomentosum, *R. Br.*

LABIATEÆ.

Plectranthus parviflorus, *Willd.*
Mentha satureioides, *R. Br.* Pennyroyal.
Ajuga australis, *R. Br.* Australian Bugle.

AMARANTACEÆ.

Deeringia celosioides, *R. Br.*
Nyssanthes diffusa, *R. Br.*

CHENOPODIACEÆ.

Rhagodia hastata, *R. Br.*
Enchylæna microphylla, *Moq.* (?)

POLYGONACEÆ.

Polygonum plebeium, *R. Br.*
Polygonum minus, *Huds.*
Rumex crispus, *Linn.* Curled Dock.
Rumex Brownii, *Camp.*
Rumex acetosella, *Linn.* Sorrel.

PIPERACEÆ.

Piper novaæ-hollandiæ, *Miq.* Pepper Vine.
Peperomia reflexa, *A. Dietr.*

LAURINEÆ.

Cryptocarya obovata, *R. Br.*
Cryptocarya glaucescens, *R. Br.*
Cryptocarya triplinervis, *R. Br.*
Litsea dealbata, *Nees.*
Litsea reticulata, *B. & H.* Bolly Gum or Bally Gum.

PROTEACEÆ.

Grevillea robusta, *A. Cunn.* Silky Oak.

THYMELEACEÆ.

Pimelea pauciflora, *R. Br.*
Pimelea ligustrina, *Labill* (?). Leaves only.
Pimelea sp. Leaves only.
Wickstroemia indica, *C. A. Mey.*

LORANTHACEÆ.

Loranthus eucalyptifolius, *Sieb.*
Loranthus congener, *Sieb.* Both species parasitic on a number of trees, but the latter particularly abundant on *Acacia Maidenii*, and *Acacia decurrens*, var. *pauciglandulosa.*

SANTALACEÆ.

Thesium australe, *R. Br.*
Choretrum Candollei, *F. v. M.*
Exocarpus cupressiformis, *Labill.* Native Cherry.

EUPHORBIACEÆ.

Breynia oblongifolia, *Muell. Arg.*
Hemicyclia australasica, *Muell. Arg.*
Croton insularis, *Baill.* Native Cascarilla Bark.
Croton acronychioides, *F. v. M.*
Baloghia lucida, *Endl.* Scrub Bloodwood.
Claoxylon australe, *Baill.*
Acalypha capillipes, *F. v. M.*
Alchornea ilicifolia, *Muell. Arg.*, Native Holly.
Mallotus philippinensis, *Muell. Arg.*
Homalanthus populifolius, *Grah.* Bleeding Heart.

URTICACEÆ.

Trema aspera, *Blume.* Peach Bush or Poison Peach.
Malaisia tortuosa, *Blanco.*
Pseudomorus Brunoniana, *Bureau.* Axe-handle Wood.
Ficus eugenioides, *F. v. M.* (?). Small-leaved Fig.
Ficus macrophylla, *Desf.* Moreton Bay Fig.
Ficus Watkinsiana, *Bail.* Large-fruited Fig.
Laportea gigas, *Wedd.* Stinging Tree.
Elatostemma reticulatum, *Wedd.*
Parietaria debilis, *Forst.*

CASUARINEÆ.

Casuarina torulosa, *Ait.* Forest Oak.

CONIFERÆ.

Araucaria Cunninghamii, *Ait.* Hoop Pine.
Araucaria Bidwillii, *Hook.* Bunya Pine.

ORCHIDEÆ.

Liparis mowbulana, *Bail.* (In leaf only.)
Dendrobium speciosum, *Sm.*, var. *Hillii*, *F. v. M.* Rock or Tree Lily. Some of the cliff sides were literally covered with this orchid in full bloom at the time of the visit.
Dendrobium gracilicaule, *F. v. M.*
Dendrobium pugioniforme, *A. Cunn.* Spear Orchid.
Dendrobium linguiforme, *Swartz.*
Dendrobium teretifolium, *R. Br.*
Dendrobium Beckleri, *F. v. M.*
Calanthe veratrifolia, *R. Br.*
Sarcochilus parviflorus, *Lindl.*
Sarcochilus falcatus, *R. Br.*
Diuris maculata, *Sm.*

LILIACEÆ.

Smilax australis, *R. Br.*
Rhipogonum album, *R. Br.*
Eustrephus latifolius, *R. Br.*, var. angustifolius, *Benth.*
Geitenoplesium cymosum, *A. Cunn.*
Bulbine bulbosa, *Haw.* Native Onion.
Dianella lævis, *R. Br.*
Dianella cærulea, *Sims.*

COMMELINACEÆ.

Pollia crispata, *Benth.*

JUNCACEÆ.

Xerotes multiflora, *R. Br.*
Xanthorrhæa arborea, *R. Br.* Grass Tree.
Juncus pauciflorus, *R. Br.*
Luzula campestris, *DC.*

CYPERACEÆ.

Cyperus tetraphyllus, *R. Br.*
Lepidosperma concavum, *R. Br.*
Gahnia aspera, *Spreng.*
Carex paniculata, *Linn* (?)

GRAMINEÆ.

Panicum pygmæum, *R. Br.*
Pennisetum compressum, *R. Br.* Swamp Foxtail.
Imperata arundinacea, *Cyr.* Blady Grass.
Andropogon refractus, *R. Br.* Barbed Wire Grass.
Anthistiria ciliata, *Linn.* Kangaroo Grass.
Aristida vagans, *Cav.*
Stipa micrantha, *Cav.* Bamboo Grass.
Deyeuxia Forsteri, *Kunth.*
Danthonia longifolia, *R. Br.*
Cynodon dactylon, *Pers.* Couch Grass.
Phragmites communis, *Trin.* Common Reed.
Poa cæspitosa, *Forst.*
Festuca bromoides, *Linn.*

FILICES.

Botrychium ternatum, *Sw.* Parsley Fern.
Alsophila australis, *R. Br.* Tree Fern.
Alsophila excelsa, *R. Br.* Tall Tree Fern.
Dicksonia antarctica, *Labill.* Mountain Tree Fern.
Dicksonia davallioides, *R. Br.*
Davallia pyxidata, *Cav.* Hare's Foot Fern.
Adianthum æthiopicum, *Linn.* Maiden Hair Fern.
Adianthum diaphanum, *Blume.*
Adianthum formosum, *R. Br.* Large Maiden Hair.
Hypolepis tenuifolia, *Bernh.*
Cheilanthes tenuifolia, *Swartz*, var. Sieberi, *Hook. f.*
Pteris falcata, *R. Br.*
Pteris paradoxa, *Baker.*
Pteris umbrosa, *R. Br.*
Pteris tremula, *R. Br.*
Pteris aquilina, *Linn.*, var. esculenta, *Hook.* Common Bracken.
Coodia aspera, *R. Br.*
Doodia caudata, *R. Br.*
Asplenium nidus, *Linn.* Bird's Nest Fern.
Asplenium flabellifolium, *Cav.*
Asplenium falcatum, *Lam.*
Asplenium umbrosum, *J. Sm.*
Aspidium aristatum, *Sw.*
Aspidium decompositum, *Spreng.*
Polypodium tenellum, *Forst.*
Polypodium serpens, *Forst.*
Polypodium confluens, *R. Br.*
Polypodium attenuatum, *R. Br.*
Notholæna distans, *R. Br.*
Platycerium grande, *J. Sm.*; Staghorn Fern. Though this fern was not seen on the visit, Mr. Walker informed us that Staghorn Ferns are to be found along certain creeks. It may be here remarked that in Queensland *Platycerium grande* is always known as the "Staghorn Fern" and *P. alcicorne* as the "Elkhorn Fern." In the Southern States the popular names are reversed for the two species.

Dairying.

SUDAN GRASS AS FODDER FOR STOCK.

In reply to a question as to whether Sudan Grass can be safely fed green to stock without any danger of poisoning, Mr. J. C. Brünnich, Agricultural Chemist, advised:—"We have never heard that Sudan Grass contained an excessive amount of cyanogenetic poison, and it may, therefore, be used safely to feed stock. Sometimes it is quite free of the poison, and only traces were sometimes found."

In corroboration of this statement, Mr. Cuthbert Potts, Principal of the Queensland Agricultural College, gives the following testimony as to the virtues of this grass as a stock food. He writes:—

"Without doubt this crop has shown itself one of the best fodders ever grown at the College. Planted early in the summer, three or four cuttings can be got off and made into ensilage or hay. The crop can be fed green or grazed. In our district the crop will live through the winter, remaining fairly green and making slow growth; and we have had the same planting stand over a period of three years with success. As a feed the grass is nutritious, and is well liked by both cattle and horses. In its green state it is a good milk-producer; and as hay it makes a splendid feed for working horses. When once established, Sudan Grass stands dry weather better than any other of our summer crops. Recently, however, it was reported that stock had been poisoned by grazing on Sudan Grass. To test this, the College carried out the following trial:—This winter we had a second growth of Sudan Grass which grew from July to September and had attained a height of nearly 3 ft. About 15 head of young bulls, 1½ to 2½ years of age, were allowed to graze this, and were allowed no other food. Further, six of the animals were starved for forty-eight hours before, so as to induce them to glut themselves with the Sudan Grass, as we considered that this would be as severe a test as possible. The remainder of the stock were well fed just before, so that they went on to the crop with full stomachs. These stock remained on the Sudan Grass for over two months. They have had no other feed, yet they all did exceptionally well. Certainly, there was no poisoning. This test does not prove that Sudan Grass is never poisonous, but it does indicate that under ordinary conditions the crop is quite safe to graze. The point is of importance, for, if it can be safely grazed, Sudan Grass has such qualities that it must become one of our most important summer crops."

BRAN FOR TOWN DAIRYMEN.

Mr. M. A. O'Callaghan, Chief of the Dairy Branch, Department of Agriculture, New South Wales, in 1912, published a most valuable work on "Dairying in Australia, Farm and Factory." Dealing with Fodders and Rations for dairy cows, he stated that bran is one of the most useful concentrated feeds to the dairyman. It contains, comparatively speaking, a large amount of albuminoid matter, and is fairly rich in carbo-hydrate matter and fat. Bran is deficient in lime, but it contains a good percentage of phosphorus, which is a very essential constituent of any ration for dairy cows, as it is strongly represented in the mineral matter of milk. Fed with lucerne hay, the deficiency in lime will be made up for; hence the value of the two as a combination. Bran, owing to the high percentage of albuminoids and phosphorus combined, acts as a stimulating food, and is thus very useful to dairy cows, and tends to increase the flow of milk. For cows that are kept in somewhat confined conditions, like town cows, bran is a very valuable food, as it keeps the cow in a suitable condition at the approaching calving time and after calving also.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Dr. Illingworth and Mr. E. Jarvis, Entomologists to the Bureau:—

The majority of the grey-back beetles are now in their third stage, the stage in which they do their greatest damage to the cane roots. We found them abundantly following the plough, both at Greenhills and Meringa. The first specimens of this stage, for this season, were collected on 25th January.

FIELD EXPERIMENTS.

The cane at Meringa, which was badly infested with *frenchi* grubs early in the season, continues to improve. Since this field is near by, we have been able to keep close observation upon the activities of the grubs, and their effect upon the growth of the cane.

During the past month some small animal—presumably a bandicoot—has dug small holes near the roots of the infested stools. Investigation shows that these holes are confined to the diseased areas, for there is no digging at the roots of the healthy canes. Furthermore, it is now almost impossible to find *frenchi* grubs under the stools where this animal has worked.

We made attempts to catch the animal with various rattraps, baited with grubs, without success. In every instance the bait was removed from the trap without springing it.

Our 10-acre plots at Meringa are now all ploughed for the second time, in preparation for early planting. The second crop of Mauritius beans on part of this was very heavy, and went under well (25th January), so there will be plenty of humus in this area. Arsenic was applied to the vegetation on several of these plots, previous to the first ploughing, in September; and it was interesting in following the plough, this second time, to observe that there was a noticeable decrease of the grubs on the poisoned areas.

DISTRIBUTION OF GRUBS AT GREENHILLS.

The relation of feeding trees to distribution of grubs is well illustrated on a large estate like Greenhills. The centre of the estate suffers little, if at all, from infestation; while the fields bordering the forest or scrub are often almost a total loss. These observations are further borne out in following the plough in various parts of the estate. Very few grubs are turned up in the central fields, while they become exceedingly numerous on the edges of the plantation.

INSECT ENEMIES OF CANE GRUBS.

With further reference to the question of digger-wasp parasites—alluded to last month—it will be of interest to mention a few facts respecting the economy of *Dielis formosus*, which, although a well-known species, has not hitherto been bred artificially from the egg, or, indeed, closely studied during the earlier stages of its life.

The female of this handsome digger-wasp, which measures about an inch in length, is mostly black, but ornamented on the abdomen or hind body with three conspicuous broad bands of bright orange colour.

A specimen captured in a canefield last December lived fifty days in confinement at our insectary, during which period it deposited no less than 65 eggs on grubs of the cane beetle (*Lepidiota frenchi*). It may, however, have laid a number of eggs before being caught by us.

Its mode of ovipositing is similar to that adopted by the digger-wasp (*Camsomeris radula*). The white, slightly curved egg is about an eighth of an inch in length, elongate-cylindrical, one of its rounded ends being glued to the under surface of the third abdominal segment of the grub near the legs, in such manner as to project at right angles from the body.

After an interval of three days, the young maggot ruptures the free or head-end of the egg, and remaining inside the attached shell or chorion bends downwards until able to reach the skin of the paralysed host, through which the head is then inserted preparatory to sucking its internal juices.

The average period occupied by the larval stage of *D. formosus* during midsummer is less than eight days (7.75); and about five weeks are passed in the cocoon before the wasp emerges.

The percentage of male and female specimens derived from the sixty-five eggs already mentioned was about equal, and, although maggots producing the latter sex are much the larger, they develop more rapidly, and therefore mature as quickly as those of the male wasps.

About 8 per cent. of grubs used in this experiment died prematurely, owing possibly to having been stung too severely, or perhaps sustained minor injuries when collected in the field. In such cases the parasites, of course, were unable to mature.

Fully 20 per cent. of the eggs were destroyed by a species of mite that very often occurs as a predaceous enemy on the bodies of soil-frequenting white grubs. In a few cases we found that an obscure disease (not yet determined) had destroyed the egg; while in some instances it had been rubbed off by the legs of the insufficiently paralysed grub.

In view of the fact that the entire life-cycle of this digger-wasp is completed in less than two months, and that within a week after emerging from the cocoon the female continues its useful work, it appears highly probable that at least four, if not more, generations may occur annually. We assume such activity to be possible on account of the insect in question being parasitic upon five species of scarabæid cane grubs, two of which frequent the soil for periods of from five to six months; while the others, including *Lepidiota frenchi*, pass at least a year in the larval state. It follows, therefore, that this parasite need never be at a loss for a suitable host on which to oviposit.

Adverse climatic conditions, such as excessive wet or low temperatures, would, however, doubtless operate at times as natural checks to its increase.

Whilst dealing with this subject we may mention, as an interesting fact, that our breeding experiments this month have demonstrated that unfertilised females of the digger-wasp (*Camsomeris radula*) will commence oviposition four days subsequent to emergence from the cocoon; and that such unfertilised ova hatch in a normal manner and produce wasps of both sexes.

ADDITIONAL CANE BEETLES.

About the beginning of January specimens of a beetle together with various grubs obtained from canefields in the Gin Gin district were sent to this office by Mr. H. T. Easterby for identification. The beetles, which happened to be new to our collection, proved to be a cockchafer closely related to root-eating scarabæidæ affecting cane; while the grubs included three kinds, the largest form being a species of *Lepidiota* not occurring in the Cairns district, and the remainder representing the general *Isodon* and *Haplonycha*.

A NEW CANE PEST.

A species of bag-moth (Family, Psychidæ) not hitherto recorded as being injurious to cane is sometimes noticed in plantations around Gordonvale, where it occasions minor damage to the leaf-blade resembling that due to grasshopper injury.

The caterpillar of this species constructs as a protection a tough elongate bag of silk, covering it at first with minute woody fragments, and finally when about an inch and a-half long adding a number of slender sticks of varying length, which being attached at one end project on all sides from the surface at acute angles, near the mouth-end of the bag. Specimens of these curious case-moths are being bred at the insectary, in order that the species may be identified.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following further report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

Though we had light showers at the beginning of the month (6th to 8th), we are still suffering from drought; and late planting is eliminated.

Dry conditions have been favourable, however, for cane harvesting, the per cent. of c.c.s. remaining high. On the other hand, late in the season, practically all cane in this district is burned before cutting; hence I experienced considerable difficulty in getting mine off green. This I was particularly anxious to do, since I desired exact figures for the crop from the various plots. Though there has been much delay, due to labour difficulties, the cane is finally harvested; and the results are most interesting and valuable. These results could not have been secured had I not had the cordial co-operation of the officers of the Mulgrave Mill.

RESULTS FROM THE MERINGA EXPERIMENTAL PLOTS.

In considering the following results, it must be noted that the drought which we have experienced during the past season made it exceedingly difficult to produce a crop on these dry, red volcanic lands. The experimental block is located at the highest point on the hill, so that it is well drained, and suffers most during drought. As a consequence, the cane which was planted in April, 1918, grew very little until December—in fact, the plants were very dry and almost dead in places in November before the rains started. This condition necessitated long-continued cultivation, which was given to all the plots and extended right through the flight of the beetles to the end of January. As stated in my last report, undoubtedly this cultivation was a most important factor in the control of the grubs for even the check plots produced fair crops.

From the time that the grubs began to be evident, in March, the value of arsenic has been noticeable in the treated plots; and injury was so apparent in the plots where meatworks manure had been applied as to suggest that this fertiliser is very attractive to the pest. At the same time there was no apparent value from the use of sulphate of ammonia. This result is probably due to the fact that the fertiliser was applied too early—fully three months before the rains began in December. Nitrate of soda, however, applied at the same time showed considerable stimulus on the cane. These facts will be further emphasised in the following summary, which indicates the treatment of the several plots, and gives the tons of cane per acre, followed by the average per cent. of c.c.s. for each plot:—

SUMMARY OF THE CROP.

Block.	Tons Cane per acre.	Per cent. c.c.c.
1. Beans sprayed with sodium arsenite, September, 1917, using arsenic at the rate of 20 lb. per acre	23.463	15.06
2. Sodium arsenite sprayed in drill near plants, May, 1918, using arsenic at the rate of 10 lb.	18.076	15.31
3. Sodium arsenite sprayed on weeds, September, 1917, using arsenic at the rate of 10 lb. before ploughing, 2 cwt. sulphate of ammonia applied August, 1918, when cane was waist-high	16.658	15.74
4. Meatworks manure applied August, 1918, at the rate of 5 cwt. per acre	19.890	13.83
5. Nitrate of soda applied at the rate of 2 cwt. per acre, August, 1918	22.758	15.86
6. Same treatment as Block 5, with meatworks manure added at the rate of 5 cwt.	17.955	15.39
7. Beans sprayed with arsenate of lead at the rate of 10 lb. per acre, September, 1917	25.914	14.10
8. Meatworks manure, at the rate of 5 cwt. per acre, mixed with 20 lb. white arsenic, placed in drill on plants, May, 1918	24.849	14.76
9. Arsenate of lead sprayed on weeds, at the rate of 10 lb. before ploughing, September, 1917	22.484	15.30
10. White arsenic at the rate of 10 lb. per acre, dusted on wet beans, September, 1917, before ploughing	29.400	13.70
11. White arsenic, at the rate of 10 lb. per acre, placed in drill with plants, May, 1918	25.024	14.25
12. Meatworks manure, at the rate of 5 cwt. per acre, with 10 lb. white arsenic placed in drill with plants, May, 1918	18.960	14.39
13. Beans, with no special treatment except cultivation	21.840	14.92
14. Lime (CaO) applied at the rate of 1 ton per acre, October, 1917, before ploughing	19.959	15.17
15. Check, no treatment except thorough cultivation	15.206	14.62

As is well recognised by every agriculturist, it is a very difficult matter to select a field so that all the plots will have the same soil and other natural advantages. In every case this must be taken into consideration in comparing results. There are so many factors affecting the growth of a crop that one cannot be too careful in a study of their relationships. By comparing results of the plots in every possible way, as

indicated below, I have arrived at the approximate value of each of the cultural factors of grub control, other than cultivation, expressed in tons per acre:—

SHOWING VALUE OF THE VARIOUS TREATMENTS.

	Tons.
Meatworks manure, 5 cwt. per acre.	
Comparing Blocks 5 and 6, decrease	4.803
Comparing Blocks 11 and 12, decrease	6.064
Average loss due to application of this fertiliser	5.433
Mauritius beans, 2 crops, ploughed in.	
Comparing Blocks 13 and 15, increase	6.634
Comparing Blocks 10 and 11, increase	4.376
Comparing Blocks 1 and 2, increase	5.387
Average increase due to the beans	5.465
White arsenic, 10 lb. per acre.	
Comparing Blocks 11 and 15, increase	9.818
Comparing Blocks 10 and 15, increase	8.729
Comparing Blocks 10 and 13, increase	7.560
Average increase due to this treatment	8.702
Lead arsenite, 10 lb. per acre.	
Comparing Blocks 7 and 13, increase	4.074
Comparing Blocks 9 and 15, increase	7.278
Average increase due to this treatment	5.676
Sodium arsenite (Solution), 10 lb. arsenic per acre.	
Comparing Blocks 2 and 15, increase	2.870
Comparing Blocks 1 and 13, increase	1.623
Average increase due to this treatment	2.246
Nitrate of soda, 2 cwt. per acre.	
Comparing Blocks 6 and 15, increase	8.182
Comparing Blocks 5 and 15, increase	7.552
Average increase due to this treatment	7.867
Lime (CaO), 1 ton per acre.	
Comparing Blocks 14 and 15, increase	4.753
Sulphate of ammonia, 2 cwt. per acre.	
No noticeable result, because applied too early.	

Using these values, I went over the figures for the various plots, comparing them with the check, No. 15, and found them conservative.

GENERAL CONCLUSIONS.

Most surprising, meatworks manure appears to be very detrimental to this type of grub-infested soils. Not only the cost of the fertiliser and its application, but more important is the material decrease in the crop. This evidently is explained by the fact that the manure is attractive to the pest.

The relative value of the various forms of arsenic is also important, and it is interesting to know that the common white arsenic (arsenious acid), which is cheapest and most easily applied, is the most effective.

Apparently it is not wise to apply sulphate of ammonia until after the rains begin. These results, however, should not be taken as indicating that this fertiliser is not valuable for cane, for I have often seen most remarkable stimulus from its use when properly applied. We should recognise, moreover, that this is a home product, and by proper handling it has even a higher nitrogen value than the imported nitrate of soda. In any case, best results are secured on land which has had a dressing of lime (calcium carbonate preferably), but the two should not be applied at the same time.

Nitrate of soda, on the other hand, is apparently not so easily decomposed, and was not wasted during the long delay experienced before rains fell; and the results on the crop are apparent.

The value of the green crop on these soils is also very noticeable, for they are poor in both humus and nitrogen, which are supplied by the beans.

Lime, too, gave evident results, which doubled the money put into its application.

General Notes.

COTTON SEED MEAL.

Cotton-seed meal is one of the richest and most valuable cattle food-stuffs. Its food value exceeds that of maize meal by 62 per cent., and wheat meal by 67 per cent.

The following is an average analysis of samples of cotton-seed meal:—

Water	7.80
Fat	9.31
Protein (albuminoids, &c.)*	42.00
Nitrogen free extract (carbohydrates, &c.) ..	27.83
Fibre	7.18
Ash†‡	5.88

Cotton-seed is also a valuable manure, chiefly on account of its richness in nitrogen, but it is far more economical to feed it to cattle, when 80 per cent. of its manurial value is recovered in the dung.

THE FEEDING VALUE OF COTTON-SEED PRODUCTS.

Under this a large amount of information has been brought together on the results of feeding experiments with cotton-seed produced in the United States and in England.

"Raw cotton-seed cannot be successfully fed to animals, as the lint and dust render it injurious, and it is too rich. It appears to be especially injurious to pigs." So wrote Professor J. P. d'Albuquerque, of the United States Department of Agriculture in 1896.

Experiments in Queensland have not borne out this condemnation of raw cotton-seed as a stock food.

Cotton-seed meal mixed with hulls is employed in enormous quantities in the United States in the fattening of cattle, and can be fed to cattle, sheep, horses, mules, and poultry. As an instance of the kind of results obtained at Woburn, England, it was found that, with fattening bullocks, a mixture of equal parts of cotton-seed cake (cotton-seed meal) and maize meal produced a larger increase in live weight and at less cost than linseed cake.

There can be no doubt that cotton-seed meal, mixed with molasses, and fed in addition to the usual green fodders, would form a valuable aid in rendering sugar plantations self-supporting.

Cotton is a crop well worth growing, seeing that it supplies not only marketable commodities—namely, cotton fibre and cotton-seed oil, for which there exists an enormous demand—but also residues of considerable value as cattle foodstuffs.

We have no oil mills in Queensland for either cotton, castor bean, linseed, olives, or other oil-producing plants such as peanuts; yet all these and many more plants of a like nature thrive in this favoured climate. In order to keep a small central oil factory employed for 100 days, it would be necessary that an area of 6,000 acres should be under cotton cultivation.

SOCIETIES, SHOW DATES, ETC.

MARYBOROUGH.—Wide Bay and Burnett Pastoral and Agricultural Society. The dates for the 1920 Exhibition of the above Society have been fixed for the 9th, 10th, and 11th June.

* Containing nitrogen=6.72.
† Containing phosphoric acid=2.42.
‡ Containing potash=1.95.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1919.

Article.		DECEMBER. Prices.
Bacon	lb.	11½d.
Barley	bush.	5s. 3d. to 5s. 6d.
Bran	ton	£10 to £11 15s.
Broom Millet	„	£40 to £58
Broom Millet (Sydney)	„	£60 to £70
Butter (First Grade)	cwt.	188s. 8d.
Chaff, Lucerne	„	£21 to £24 10s.
Chaff, Mixed	„	£15
Chaff, Oaten	„	£14 15s. to £15 15s.
Chaff, Wheaten	„	£14 to £16
Cheese	lb.	11d.
Flour	ton	£13
Hams	lb.	1s. 10d.
Hay, Lucerne	ton	£16 to £19
Hay, Oaten	„	£17 10s. to £17 15s.
Honey	lb.	6¾d. to 7½d.
Maize	bush.	8s. 1d. to 9s. 6d.
Oats	„	6s. 3d. to 6s. 6d.
Onions	ton	£10 to £15
Peanuts	lb.	7d. to 10d.
Pollard	ton	£10 15s.
Potatoes	„	£35 to £40
Potatoes (Sweet)	cwt.	9s. to 11s.
Pumpkins (Cattle)	ton	£10 to £18 6s.
Eggs	doz.	1s. 7d. to 1s. 11½d.
Fowls	per pair	4s. 5d. to 10s. 6d.
Ducks, English	„	5s. 6d. to 6s. 6d.
Ducks, Muscovy	„	7s. to 17s.
Geese	„	9s. to 14s. 6d.
Turkeys (Hens)	„	15s. 3d. to 33s.
Turkeys (Gobblers)	„	39s. to 80s.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	5s. to 17s. 6d.
Beans, per sugar-bag	4s. to 16s. 9d.
Beetroot, per dozen bunches	1s. to 2s.
Cabbages, per dozen	5d. to 18s. 6d.
Carrots, per dozen bunches	9d. to 1s.
Celery, per bundle	...
Cucumbers, per quarter-case	1s. 3d. to 2s.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	3s. 6d. to 11s.
Peas, per sugar-bag	10s. to 17s. 6d.
Potatoes (Sweet), per cwt.	9s. to 11s.
Pumpkins (table), per sack	8s. to 23s.
Tomatoes, per quarter-case	2s. 6d. to 11s. 6d.
Turnips, per doz. bunches	3s. to 4s.
Turnips (Swede), per ton	£8 10s. to £11 10s.

SOUTHERN FRUIT MARKETS.

Article.	DECEMBER. Prices.
Bananas (Queensland), per double-case	18s. to 25s.
Bananas (Tweed River), per double-case	20s. to 25s.
Bananas (Fiji), per case	22s.
Lemons, per bushel-case	25s. to 27s. 6d.
Oranges, per bushel-case	14s. to 22s.
Oranges (Navel), per bushel-case	22s. to 25s.
Passion Fruit, per double-case	22s.
Pineapples (Queens), per double-case	18s. to 20s.
Pineapples (Ripleys), per double-case	12s. to 20s.
Pineapples (Common), per double-case	10s. to 15s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	15s. to 27s. 6d.
Apples, Cooking, per bushel-case	9s. to 20s.
Bananas (Cavendish), per dozen	8d. to 1s.
Bananas (Sugar), per dozen	5½d. to 6¾d.
Cherries, per tray	12s. to 15s.
Citrons, per cwt.	9s. to 14s.
Cocoanuts, per sack	15s. to 25s.
Grapes, per lb.	1s. 5d. to 1s. 10d.
Lemons (Lisbon), per half-case	8s. to 24s.
Lemons (Rough), per cwt.	14s.
Limes, per half bushel-case	15s. to 16s. 6d.
Mangoes, per case	5s. 6d. to 11s. 6d.
Oranges, per case	5s. 6d. to 25s.
Papaw Apples, per quarter-case	1s. 9d. to 3s. 6d.
Peaches, per quarter-case	4s. to 12s.
Pineapples (Rough), per case	8s. to 16s.
Pineapples (Smooth), per case	10s. to 15s.
Pineapples (Ripley), per case	14s. to 16s.
Rock melons, per dozen	2s. to 12s.
Strawberries, per dozen pint-boxes	4s. to 6s.
Tomatoes (prime), per quarter-case	2s. 6d. to 5s. 6d.
Tomatoes (inferior), per quarter-case	2s. to 4s.
Water melons, per dozen	6s. to 25s.

TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1919.

Animal.	NOVEMBER Prices.
Bullocks	£22 to £26 5s.
Bullocks (single)	£32 10s.
Cows	£19 17s. 6d to £22 2s. 6d.
Cows (single)	£26 5s.
Merino Wethers	43s.
Crossbred Wethers	42s. 6d.
Merino Ewes	33s.
Crossbred Ewes	43s.
Lambs	35s. 6d.
Pigs (Bacon)	£4 18s. 6d.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·42	6·18	5·59	5·44
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·43
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·42
5	5·0	6·46	5·24	6·40	5·44	6·15	6·1	5·41
6	5·1	6·47	5·25	6·39	5·45	6·14	6·1	5·40
7	5·2	6·47	5·26	6·39	5·45	6·13	6·2	5·39
8	5 2	6·47	5·27	6·38	5·46	6·12	6 2	5·38
9	5·3	6·47	5·28	6·37	5·46	6·11	6 3	5·37
10	5 3	6·47	5·28	6·36	5·47	6·10	6·3	5·36
11	5·4	6·47	5 29	6·36	5·48	6·9	6·4	5·35
12	5·5	6·47	5·30	6·35	5·48	6·8	6·4	5·35
13	5·6	6·47	5·31	6·35	5·49	6·7	6 4	5·34
14	5·6	6·47	5·31	6·34	5·49	6·6	6·5	5·33
15	5·7	6·47	5·32	6·33	5·50	6·5	6·5	5 32
16	5·8	6·47	5·33	6·32	5·50	6·4	6·6	5·31
17	5·9	6·47	5·33	6·31	5 51	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·51	6 2	6·7	5·29
19	5·10	6·47	5·35	6·29	5 52	6·1	6·7	5·28
20	5·11	6·47	5·35	6·28	5·52	6 0	6·8	5·27
21	5·12	6·46	5·36	6 28	5·53	5·59	6 8	5·26
22	5·13	6·46	5·36	6·27	5·53	5·58	6·9	5·25
23	5·14	6·46	5·37	6·26	5 54	5·57	6 9	5 24
24	5·15	6 45	5·38	6·25	5·54	5 56	6·10	5·23
25	5·16	6·45	5·38	6·24	5·55	5·55	6·10	5·22
26	5·16	6·45	5·39	6·23	5·56	5·53	6·11	5·21
27	5·17	6·44	5·40	6 22	5 56	5·52	6·11	5·20
28	5·18	6·44	5·41	6·21	5 57	5·50	6·12	5·19
29	5·19	6·43	5·41	6·20	5·57	5·49	6·12	5·18
30	5·20	6·43	...	...	5·58	5·48	6·13	5·18
31	5·21	6·42	...	...	5 58	5·47	...	...

PHASES OF THE MOON.

The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical.

			H.	M.	
6 Jan.	○	Full Moon	7	5	a.m.
13 „	☽	Last Quarter	10	9	a.m.
21 „	●	New Moon	3	27	p.m.
29 „	☾	First Quarter	1	38	a.m.

Perigee on 5th, Apogee on 17th. (An occultation of the planet Venus by the Moon will take place on the 17th. Unfortunately not visible in Australia.)

4 Feb.	○	Full Moon	6	42	p.m.
12 „	☽	Last Quarter	6	49	a.m.
20 „	●	New Moon	7	35	a.m.
27 „	☾	First Quarter	9	50	a.m.

Perigee on 2nd and 28th, Apogee on 13th

5 Mar.	○	Full Moon	7	13	a.m.
13 „	☽	Last Quarter	3	57	a.m.
20 „	●	New Moon	8	56	p.m.
27 „	☾	First Quarter	4	45	p.m.

Apogee on 12th, Perigee on 24th.

3 Apr.	○	Full Moon	8	55	p.m.
11 „	☽	Last Quarter	11	24	p.m.
19 „	●	New Moon	7	43	a.m.
25 „	☾	First Quarter	11	28	p.m.

Apogee on 9th, Perigee on 21st.

There will be no eclipse of the Sun or Moon till May 3rd.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1919.	Nov., 1918.		Nov.	No. of Years' Records.	Nov., 1919.	Nov., 1918.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	2·33	18	0·53	1·82	Nambour	3·88	23	0·30	1·57
Cairns	4·20	37	2·26	2·67	Nanango	2·65	37	0·65	1·07
Cardwell	4 30	47	1·08	1·73	Rockhampton ...	2·19	32	0·63	0·83
Cooktown	2·90	43	0·37	0·78	Woodford	3·17	32	0·50	0·72
Herberton	2·53	32	0·61	3·77					
Ingham	4·12	27	1·27	3·04					
Innisfail	6·66	38	1·23	12·34					
Mossman	5·08	11	2·52	5 86					
Townsville	1·94	48	0·16	2·48	*Darling Downs.*				
					Dalby	2·59	49	0·48	0·31
Central Coast.					Emu Vale	2·49	23	3 46	0·19
					Jimbour	2·45	31	0·41	0·06
Ayr	1·81	32	1·05	1·20	Miles	2·60	34	0·82	0·47
Bowen	1·36	48	0·53	0·95	Stanthorpe ...	2·78	46	0·48	1·57
Charters Towers ...	1·70	37	0·04	4·09	Toowoomba ...	3·29	47	0·77	0·32
Mackay	3·00	48	1·47	2·64	Warwick	2·57	32	2·40	0·33
Proserpine	3·30	16	2·27	1·51					
St. Lawrence ...	2·44	48	0·61	5·09					
					Maranoa.				
South Coast.					Roma	2·13	45	0·38	1·26
Biggenden	2·86	20	Nil	1·17					
Bundaberg	2·69	36	0·63	1·46	*State Farms, &c.*				
Brisbane	3·66	68	0·38	2·16					
Childers	2·93	24	0·12	2·12	Bungeworgorai ...	2·53	5	0·53	1·52
Crohamhurst ...	4·51	26	0·58	0·97	Gatton College ...	2·77	20	0·65	1·83
Esk	3·18	32	1·09	2·92	Gindie	...	...	0.27	3·12
Gayndah	2·89	48	0·33	1·75	Hermitage ...	2·58	13	1·49	1·08
Gympie	3·19	49	0·05	1·36	Kairi	3·09	5	0·40	1·38
Glasshouse M'tains	3·94	11	0·04	0·58	Sugar Experiment Station, Mackay	2·76	22	1·28	2·63
Kilkivan	2·56	40	Nil	0·74	Warren	3·73	5	0·55	0·60
Maryborough ...	3·17	48	0·08	0·24					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangelwurtzels. Pick cotton as the bolls burst. Do not pick until the dew has dried off the bolls. Expose the picked cotton for a couple of hours to sun heat.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on "Market Gardening" issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, and are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstemons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the "Agricultural Journal" might be rendered of more value to our fruitgrowers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pine-apples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into the scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop of fruit ripening towards the end of wnter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit-fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes, ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the

State. For long shipment nothing can beat crates holding 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.

WHY DAFFODILS DON'T GROW.

By A. JAMIESON, Park Town, Johannesburg.

Now that the daffodil flowering season is over a few notes as to their treatment should not come amiss, as I find that most people make the great mistake of neglecting their bulbs after the flowering period, leaving them to look after themselves till the foliage dies down. This to my mind is a great mistake, as this is really the time they should be taken great care of; and before allowing the bulbs to dry up they should receive copious supplies of liquid manure at least twice a week, only discontinuing this treatment when the foliage shows unmistakable signs of going to rest. I never disturb my bulbs till the foliage has entirely died down. Then lift and store the bulbs in a cool place till you require to pot them again, if for stoep decoration; or plant in beds, if for cut flowers. I find they are not satisfactory subjects for the mixed border, as exposed to full sun they last a very short time in bloom; so it pays one to give them a spot in the garden which enjoys partial shade during the hottest part of the day, for hot sun destroys the flowers sooner than frost or wind. In England, and I should think at the Cape, they are well adapted to plant in the grass, or naturalise by the side of woodland walks or in shrub borders; and clumps planted thus can remain a long time, where they will increase in size and flower with greater profusion year after year.

LIFT AND STORE EACH YEAR.

On the High Veld they require different treatment, for if left in the ground the bulbs shrivel up and disappear altogether. They should be lifted and stored every year about November or December. Great care must be taken not to allow the bulbs to shrivel up when stored away. I usually replant about the first week in March, and make several plantations, the last of which should not be later than the last week in April. The soil used should be light and rich, though they are not very exacting as regards soil. A mixture of black soil and drift sand with well-rotted cow manure and a good dash of bone meal added suits them very well indeed. The bulbs should be planted about 4 in. deep, the base of the bulbs resting on a little sand. After finishing planting, give a good soaking of water; but care must be taken not to give too much water till growth starts, when they require careful attention as regards watering, never allowing them to become dry, as this often spells success or failure and is the cause of so many complaints about daffodil bulbs not flowering. The two periods just before and after flowering are the most critical in the life of the daffodil as regards watering and attention. The modern development of the daffodil has elevated it to the rank of the carnation and the sweet pea; and the ever-increasing new sorts bring gladness to the hearts of enthusiasts, but to the ordinary grower, especially those with limited space, it brings the problem of "Which varieties will I have most success with and find room for without expelling older sorts that are still good?" If I were asked to say what I thought were absolutely the best and most free blooming varieties to grow and most suitable for our climate, Sir Watkin, the largest in the Incomparabilis section, takes first place; next *Barri Conspicuus*, a remarkable flower of great beauty and too well known to require description. Among the large trumpets, Emperor, Golden Spur, and Henry Irvin are my favourites. The two coloured trumpets (bicolours) of the type of Empress and Horsefieldii also do well and flower freely. For those who seek fine yellow trumpets of modern interest, I know of no better daffodil than Golden Bell. This is the first year I have grown this variety, but I am more than satisfied with the results, as it responds to fair treatment and repays you with a wealth of rich coloured flowers which last a long time when cut. The foregoing varieties are those that do best with me, but it is far from exhausting the good sorts that can be well grown in this country, as those who study South African gardening will see by reading the report on the Daffodil Show held at the Cape this past spring.—"South African Gardening."